PONY

سلسلة كتب الأستاذ

ICT

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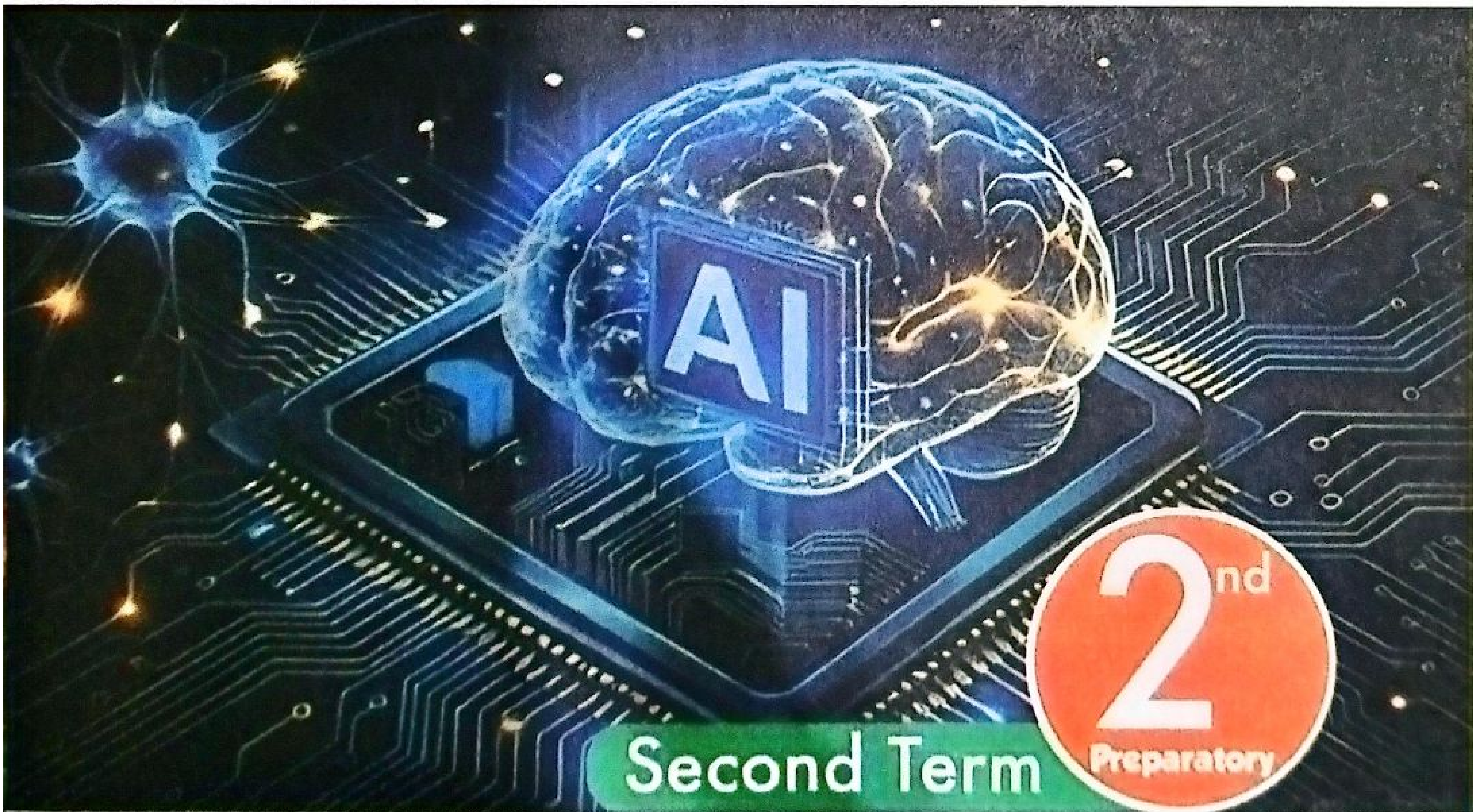

بسم الله الرحمن الرحيم

Introduction

We are delighted to introduce our comprehensive educational series "Pony" in ICT. We designed this book with an interesting and attractive style to capture your attention and keep you engaged throughout your learning journey.

We understand that learning can be challenging, which is why we have made every effort to provide clear and concise explanations of the topics covered in this book. In addition, the book includes a large number of comprehensive exercises designed to help reinforce your understanding of the concepts presented.

We have also taken great care to provide explanatory information for some of the more ambiguous points in the subject matter. We understand that some concepts may be difficult to grasp, and we have made every effort to provide clear explanations and examples to help you understand these points.

Overall, we hope that this book will help you develop a strong foundation in ICT and explore its exciting world.

We hope that you find this book informative, engaging, and enjoyable to read.

Author,
Eng. Osama Youssef

متواجدون في كافة محافظات جمهورية مصر العربية

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كل الحقوق محفوظة

لا يجوز أبدًا إعادة إنتاج أي جزء من هذا العمل ولا حفظه بأي صورة من صور الحفظ والتخزين ولا نقله بأي شكل أو أي وسيلة سواء أكانت ميكانيكية أو إلكترونية أو نسخًا أو تسجيلًا دون إذن كتابي سابق من الناشر.

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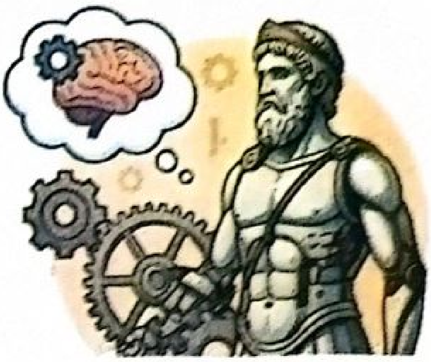
Unit 3

Programming and Artificial Intelligence (AI)

Unit Lessons:

- Lesson 1 The Historical Development of Artificial Intelligence
- Lesson 2 How Do Machines Think and Change Our World?
- Lesson 3 AI Is Everywhere Around Us
- Lesson 4 The Artificial Neuron
- Lesson 5 The Role of the Artificial Neuron in Artificial Intelligence
- Lesson 6 Introduction to Data Analysis Using Python

1 The Historical Development of Artificial Intelligence



- Did you ask yourself how personal assistants in your smartphone understand what you say?
- And how cars can drive themselves (self-driving cars)?
- This is all because of Artificial Intelligence (AI).
- AI is not a new idea. It has evolved throughout history for a very long time.
- In this lesson, we will travel through time to discover:
  - How the idea of artificial intelligence began.
  - **The most important** stages in its development.
  - How **AI became** part of our daily lives.
  - **What the future of** artificial intelligence might look like.

- هل سألت نفسك كيف يفهم المساعد الشخصي في هاتفك الذكي ما تقوله؟
- وكيف تستطيع السيارات أن تقود نفسها؟ (السيارات ذاتية القيادة)
- كل هذا بفضل الذكاء الاصطناعي(AI).
- الذكاء الاصطناعي ليس فكرة جديدة، بل تطوّر عبر التاريخ على مدى زمن طويل.
- في هذا الدرس، سنسافر عبر الزمن لنتعرّف على:

• كيف بدأت فكرة الذكاء الاصطناعي، وأهم المراحل في تطوره، وكيف أصبح الذكاء الاصطناعي جزءًا من حياتنا اليومية، وكيف يبدو مستقبل الذكاء الاصطناعي.

1 The Dream of Developing Machines that Can Think and Operate Automatically

- Before computers were invented, people dreamed of machines that could think and do tasks and work like humans.
- In ancient times, humans invented "thinking machines".
- Ancient civilizations made efforts to build machines that could work on their own (automation systems).
- These efforts were not AI as we know it today, but they were found in myths, philosophy, early mechanics, and self-operating machines.

- حُلم تطوير آلات تستطيع التفكير والعمل تلقائيًا.
- قبل اختراع أجهزة الكمبيوتر، حلَم الناس بآلات يمكنها التفكير والعمل مثل البشر.
- في العصور القديمة، حاول الإنسان اختراع آلات "تفكّر". وقد بذلت الحضارات القديمة جهودًا لبناء آلات تعمل من تلقاء نفسها (أنظمة الأتمتة).
- لم تكن هذه الجهود ذكاءً اصطناعيًا بالمعنى الحديث، لكنها ظهرت في الأساطير، والفلسفة، والميكانيكا المبكرة، والآلات ذاتية التشغيل.

2 The Modern Era of Artificial Intelligence

1 Alan Turing: The Father of Artificial Intelligence

Foundations of AI:

- In 1950, British mathematician Alan Turing founded modern AI.
- Turing asked an important question: "Can machines think?"

The Turing Test - A Simple Example:

- Imagine you are sending text messages to someone.
- You don't know if you are chatting with a human or a computer program.
- If you cannot tell the difference, then this program has passed the Turing Test!

- العصر الحديث للذكاء الاصطناعي:

① آلان تورينج: أبو الذكاء الاصطناعي.

- في عام 1950، وضع عالم الرياضيات البريطاني آلان تورينج أُسس الذكاء الاصطناعي الحديث. **اقترح تورينج سؤالًا مهمًا:** "هل يمكن للآلات أن تفكر؟"

- اختبار تورينج- مثال بسيط:
  - تخيل أنك تتحدث مع شخص ما عبر الرسائل النصية، ولا تعرف إن كان إنسانًا أم برنامج كمبيوتر. **إذا لم تستطع التمييز، فقد نجح هذا البرنامج في اختبار تورينج!**

2 The Dartmouth Conference: The Birth of the Term "AI" (1956)

The Beginning of the Term "Artificial Intelligence"

- In the summer of 1956, a group of the smartest scientists met at Dartmouth College in the USA.

Their big goal was:

- To develop machines that could learn and think like humans!
- During this conference, the term "Artificial Intelligence" was officially introduced.

❷ **مؤتمر دارتموث:** بداية ظهور المصطلح.

- في صيف عام 1956، اجتمع مجموعة من أذكى العلماء في جامعة دارتموث في أمريكا. كان هدفهم إنشاء آلات تستطيع التعلم والتفكير مثل البشر!
- في هذا المؤتمر، وُلد مصطلح "الذكاء الاصطناعي" رسميًّا.

3 Years of Excitement and Great Hopes (1956 - 1970)

Early Hopes:

- After the Dartmouth Conference, scientists created the first AI programs.
- These programs were simple compared to what we see today, but they were amazing at that time!

Examples of Early Programs:

1. Logic Theorist: A program that can solve logical mathematical problems.
2. General Problem Solver: A program that tries to solve general problems **step-by-step.**

آمال البدايات: • بعد مؤتمر دارتموث، بدأ العلماء في إنشاء أول برامج **الذكاء الاصطناعي.**

- كانت هذه البرامج بسيطة جدًّا لكنها كانت مذهلة في **ذلك الوقت.**

أمثلة على البرامج في هذه الفترة:

❶ برنامج يستطيع حل المسائل الرياضية المنطقية. ❷ **برنامج يستطيع حل المشاكل العامة خطوة بخطوة.**

Early Challenges:

1. **Computers were** very slow **with** limited memory.
2. **Computers need hours to solve a simple math problem that a child could solve in minutes!**

التحديات الأولى: • كانت أجهزة الكمبيوتر بطيئة للغاية وذات ذاكرة **محدودة.**

- تحتاج أجهزة الكمبيوتر إلى ساعات لحل مسألة **رياضية بسيطة يمكن لطفل حلها في دقائق!**

4 Expert Systems: Machines Learn from Experts (1970 - 1980)

» In the 1970s, scientists had a great idea: instead of trying to make machines think like humans, why not teach them special knowledge from experts?

MYCIN: The Robot Doctor:

- One of the most famous expert systems was MYCIN.
- It is a program that helps doctors diagnose infectious diseases.
- It would ask questions like:

  Does the patient have a fever? **Or** *What are the other symptoms?*
- Then it would suggest the treatment!
- MYCIN's accuracy was as good as expert doctors.

« الأنظمة الخبيرة – الآلات تتعلم من الخبراء:

- في السبعينات، خطرت للعلماء فكرة رائعة: بدلاً من محاولة جعل الآلات تفكر مثل البشر، لماذا لا نعلمها المعرفة المتخصصة من الخبراء؟
- كان الطبيب الآلي MYCIN أحد أشهر أنظمة الخبراء:

كان يساعد الأطباء في تشخيص الأمراض المعدية، كان يطرح أسئلة مثل: "هل يعاني المريض من حمى؟ ما هي الأعراض الأخرى؟" ثم يقترح العلاج المناسب! والمذهل أن دقته كانت تنافس دقة الأطباء الخبراء من البشر.

5 AI Winter – When Dreams Faded (1980 - 1990)

The Great Challenges:

In the 1980s, AI faced a real crisis. The great initial excitement turned into disappointment. Why?

1. Overstated Promises: Scientists promised more than they could achieve.
2. Technical Limitations: Computers were still slow and had limited memory.
3. High Cost: Developing these systems was very expensive.
4. Limited Results: Programs worked only in very narrow fields.

Lessons learned:

- This period wasn't all bad! Scientists learned an important lesson: AI is harder than they thought, and they needed patience and better development.
- Sometimes we need to face failure to learn and become stronger!

» شتاء الذكاء الاصطناعي - عندما تبددت الأحلام

- التحديات الكبرى: في الثمانينات، واجه الذكاء الاصطناعي أزمة حقيقية. الحماس الكبير في البداية تحول إلى خيبة أمل! لماذا؟
- الوعود المبالغ فيها: العلماء وعدوا بأكثر مما استطاعوا تحقيقه.
- قيود التقنية: الكمبيوترات ما زالت بطيئة وذاكرتها محدودة.
- تكلفة عالية: تطوير هذه الأنظمة كان مكلفًا جدًّا.
- نتائج محدودة: البرامج كانت تعمل في مجالات ضيقة جدًّا.
- الدروس المستفادة من تلك التحديات: هذه الفترة لم تكن سيئة تمامًا، فقد تعلم العلماء درسًا مهمًّا: الذكاء الاصطناعي أصعب مما كانوا يعتقدون، وهم بحاجة إلى صبر وإلى تطوير أفضل.
- أحيانًا نحتاج لتحدي الفشل لنتعلم ونصبح أقوى!

6 The Renaissance – A Return of Hope (1990 - 2010)

The Internet and Data Revolution:

- In the 90s, the Internet appeared!
- Suddenly, scientists had huge amounts of data to work with.

Machine Learning: A New Way to Teach Machines:

- Instead of programming machines with knowledge, scientists decided to teach them how to learn from data by themselves.
- This is called "Machine Learning".

EX Teaching a computer to distinguish between pictures of cats and dogs. Instead of describing the cat's shape ("it has pointed ears and whiskers"), you feed the computer thousands of labeled images and let it discover the patterns itself!

Amazing Achievements:

- For the first time in history, a computer beat the world chess champion! It was an amazing event watched by millions around the world.

» عصر النهضة – عودة الأمل:

» ثورة الإنترنت والبيانات: في التسعينات، حدث شيء مذهل: ظهر الإنترنت! فجأة، أصبح لدى العلماء كميات هائلة من البيانات للعمل عليها.

» تعلم الآلة- نهج جديد: بدلًا من برمجة الآلات بالمعرفة، قرر العلماء تعليمها كيف تتعلم بنفسها من البيانات! هذا ما يُسمى "تعلم الآلة".

» مثال: تعليم الكمبيوتر أن يميز بين صور القطط والكلاب. بدلًا من وصف شكل القطة (لها أذن مدببة وشارب)، يتم تغذية الكمبيوتر بآلاف الصور المصنفة ويتركونه يكتشف الأنماط بنفسه!

» إنجازات مذهلة: للمرة الأولى في التاريخ، فاز الكمبيوتر على بطل العالم في الشطرنج! كان حدثًا مذهلًا شاهده ملايين الناس حول العالم.

7 The Modern Revolution – Deep Learning Changes Everything (2010-Now)

Deep Learning:

- It is an advanced type of Machine Learning that mimics the way the human brain works!
- It uses Artificial Neural Networks.

How It Works:

- Think of your brain as a network of interconnected neurons.
- Each cell receives signals and sends out others.
- Deep Learning mimics this process!

Amazing Achievements:

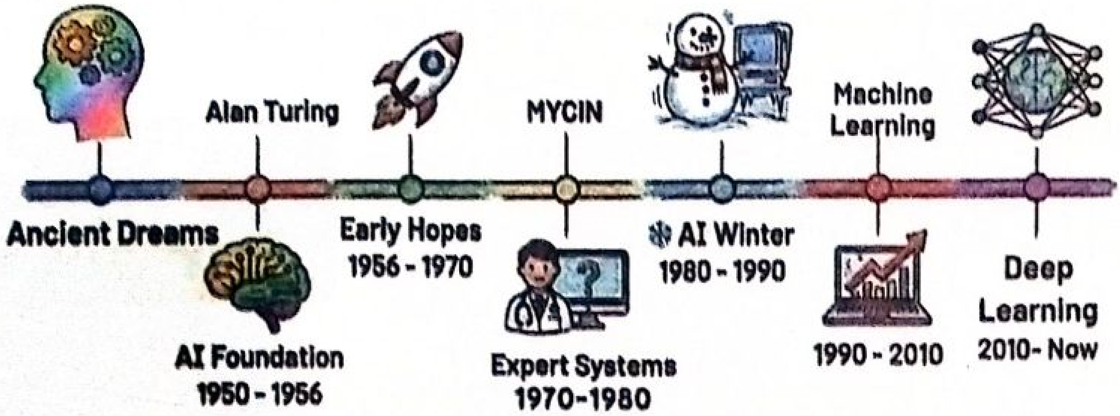
- A computer won against the world champion in the Chinese game "AlphaGo". This game is much harder than chess!

» الثورة الحديثة – التعلم العميق يغير كل شيء.

» التعلم العميق: هو نوع متقدم من تعلم الآلة يحاكي طريقة عمل الدماغ البشري! يستخدم ما يُسمى "الشبكات العصبية الاصطناعية".

» كيف يعمل: فكّروا في دماغكم كشبكة من الخلايا العصبية المترابطة. كل خلية تستقبل إشارات وترسل إشارات أخرى. التعلم العميق يحاكي هذه العملية!

- فوز الكمبيوتر على بطل العالم في لعبة "AlphaGo" الصينية، وهي لعبة أصعب بكثير من الشطرنج!



أهم الكلمات والمصطلحات			
Conference	مؤتمر	Machine Learning	تعلُّم الآلة
Enthusiasm	حماس	Neural Networks	الشبكات العصبية
Expert Systems	الأنظمة الخبيرة	Deep Learning	التعلُّم العميق

Exercises on Lesson 1

1 Choose the correct answer:

1 What is the best description of AI?

a. Making machines faster and stronger.

b. Making machines think and learn like humans.

c. Making machines larger in size.

d. Making machines smaller in size.

2 Who is the scientist who created a famous test to see if a machine is intelligent?

a. Isaac Newton
b. Albert Einstein
c. Alan Turing
d. Al-Khwarizmi

3 .... is an early program that could solve logical mathematical problems.

a. Logic Theorist
b. AlphaGo
c. MYCIN
d. General Problem Solver

4 What was "MYCIN"?

a. Robot Chef
b. Robot Doctor
c. Robot Pilot
d. Robot Teacher

5 Why is learning AI important for your future?

a. Because it will disappear soon.

b. Because it will become an essential part of our jobs and daily lives.

c. Because it is a difficult and complex topic only for scientists.

d. Because it is a fun tool.

6 In the 1970s, scientists created .... to teach machines special knowledge from experts.

a. self-driving cars
b. neural networks
c. expert systems
d. none of them

7 Teaching a computer to play chess and win against the best players is an early example of ....

a. machine learning
b. the Internet
c. 3D printing
d. using Office software

8 In the 1990s, the appearance of .... provided huge amounts of data for scientists.

a. self-operating machines
b. MYCIN
c. the Internet
d. logic programs

9 How can AI help solve the traffic congestion problem?

a. Manufacturing more cars.
b. By analyzing data and organizing traffic flow smartly.
c. By removing traffic lights.
d. By disabling car movement.

10 Teaching a computer to learn from data by itself instead of programming it with knowledge is called ....

a. machine learning
b. automation
c. philosophy
d. the Turing Test

11 The phrase "AI is a powerful tool" means that: ....

a. We should fear and avoid it.
b. No one can control it.
c. To use it irresponsibly.
d. We must understand its impact and direct it to help people.

12 .... is an advanced type of Machine Learning that mimics the human brain.

a. Simple logic
b. Early mechanics
c. Deep Learning
d. Expert systems

13 Deep Learning uses what is called ....

a. Artificial Neural Networks
b. automation systems
c. Turing Test
d. text messages

14 One reason for the AI crisis was that scientists made .... promises.

a. very small
b. realistic
c. no
d. overstated

2 Put (✓) or (✗):

1. The idea of AI is a very modern idea that appeared in the last few years. ( )
2. The idea of AI faced many challenges in its early days. ( )
3. The Turing Test is a way to know if a machine can successfully simulate human thinking. ( )
4. Machine Learning is a branch of AI that allows computers to learn from experience. ( )
5. AI is only used in games and entertainment. ( )
6. Deep Learning is an advanced type of Machine Learning. ( )
7. AI will be a helpful tool in many future jobs. ( )
8. Alan Turing is often called the "Father of Artificial Intelligence". ( )
9. The term "Artificial Intelligence" was first used in 1990. ( )
10. Early AI programs like "General Problem Solver" were as fast as modern laptops. ( )
11. Expert systems try to copy the knowledge of specialized human experts. ( )
12. Machine Learning allows computers to learn from data instead of being programmed for every step. ( )
13. Deep Learning uses "Artificial Neural Networks" to process information. ( )
14. Learning about AI is only important for people who want to be scientists. ( )
15. AI can help solve traffic congestion by analyzing data and organizing flow. ( )

3 Complete in the blanks:

1 British mathematician .... is known as the "Father of Artificial Intelligence."

2 The term "Artificial Intelligence" was officially born during the .... Conference in 1956.

3 Expert Systems, like .... , were designed to learn from human experts.

4 In ...., instead of programming every rule, we feed the computer data and let it learn patterns by itself.

5 .... is an advanced type of AI that mimics how the human brain's neural networks work.

Lesson 2

How Do Machines Think and Change Our World?

- Have you ever noticed that your phone suggests a song to you without you asking for it, or that an educational app knows exactly the topics you need help with?
- This is not magic; it is the power of Artificial Intelligence.
- Artificial Intelligence makes machines act as if they are thinking and interacting as humans.

- هل لاحظت يومًا أن هاتفك يقترح عليك أغنية دون أن تطلبها، أو أن تطبيقًا تعليميًّا يعرف بالضبط الموضوعات التي تحتاج فيها للمساعدة؟
- الذكاء الاصطناعي يجعل الآلات تتصرف وكأنها تفكر وتتفاعل مثل البشر.

Examples of AI in Our Daily Life

In Your Phone	In Games	On the Internet
• Voice assistants • Facial recognition • Text prediction المساعدات الصوتية والتعرف على الوجه وتوقع النصوص.	• Smart characters that interact and adapt with you شخصيات ذكية تتفاعل وتتكيف معك.	• Smart search engines • Personalized content suggestions محركات البحث الذكية. اقتراحات المحتوى المخصص.

Artificial Intelligence:

- It's the ability of machines to "think", make decisions, and solve problems.

- الذكاء الاصطناعي : هو قدرة الآلات على "التفكير" واتخاذ القرار وحل المشكلات.

- AI can be also defined as the ability of computer systems to simulate some human abilities, such as:
  - Learning from data.
  - Making decisions.
  - Solving problems.
  - Understanding natural language.
  - Recognizing patterns in images and sounds.

- ويمكن تعريف الذكاء الاصطناعي بأنه قدرة الأنظمة الكمبيوترية على محاكاة بعض القدرات المعرفية البشرية، مثل:

• التعلم من البيانات. • اتخاذ القرارات. • حل المشكلات. • فهم اللغة الطبيعية. • التعرف على الأنماط في الصور والأصوات.

Deeper Understanding of Artificial Intelligence:

- Imagine that we are building a "digital brain" for the machine.
- This brain does not have feelings or self-awareness like the human brain.
- It is designed to process huge amounts of information very quickly
- It searches for relationships and patterns to make logical and accurate decisions.

• فهم أعمق للذكاء الاصطناعي: تخيل أننا نبني "دماغًا رقميًا" للآلة، هذا الدماغ لا يمتلك مشاعر أو وعيًا ذاتيًا مثل دماغ البشري، لكنه مصمم ليكون بارعًا في معالجة كميات هائلة من المعلومات بسرعة خارقة، ويبحث عن العلاقات والأنماط لاتخاذ قرارات منطقية ودقيقة.

Comparison between Human Intelligence and Artificial Intelligence

Artificial Intelligence	Human Intelligence
Pure Data Processing: • AI does not feel emotions. • It has no self-awareness. • It only processes information and data. معالجة البيانات البحتة: لا يفهم العواطف، وليس لديه وعي ذاتي، يعالج المعلومات والبيانات فقط.	Feelings and Awareness: • Humans feel complex emotions like joy, sadness, love, and empathy. • Humans also have self-awareness. المشاعر والوعي: يشعر الإنسان بمشاعر معقدة، كالفرح والحزن والحب والتعاطف، ويمتلك وعيًا ذاتيًا.
Super Speed and Accuracy: • AI processes trillions of data points in seconds. • It executes complex tasks with high accuracy. سرعة ودقة فائقة: يعالج تريليونات من نقاط البيانات في ثوانٍ، وينفذ مهام معقدة بدقة متناهية.	Creativity and Innovation: • Humans can create new ideas and solve problems in untraditional ways. الإبداع والابتكار الأصيل: يستطيع الإنسان ابتكار أفكار جديدة تمامًا، وحل المشكلات بطرق غير تقليدية.
Logic and Pure Data: • Decisions are based on data and programmed rules, without emotions. منطق وبيانات بحتة: قرارات مبنية على البيانات والقواعد المبرمجة، بدون مشاعر.	Deep Understanding and Context: • Humans understand jokes, sarcasm, hidden meanings, and complex social situations. الفهم العميق والسياق: يفهم النكت والسخرية والمعاني الخفية، والمواقف الاجتماعية المعقدة.

Clarification Example:

» Imagine you are showing a painting to an AI.

» It can analyze colors, shapes, and objects very accurately

» However, it cannot feel the beauty of the painting, or the sadness or joy expressed in the painting, or the deep message behind it.

» The ability to understand emotions and art deeply is a human ability.

مثال للتوضيح:

« تخيل أنك تعرض لوحةً على برنامج ذكاء اصطناعي.

« يستطيع البرنامج تحليل الألوان والأشكال والأشياء الموجودة بدقة متناهية.

« مع ذلك، لا يستطيع استشعار جمال اللوحة، أو الحزن أو الفرح المُعبَّر عنه في اللوحة، أو الرسالة العميقة الكامنة وراءها.

« هذه القدرة على الفهم العميق للمشاعر والفن هي قدرة بشرية.

Why is Artificial Intelligence important to us today?

» Artificial Intelligence is now part of our daily lives. For example:

- When Google searches for your answer
- When Facebook suggests a new product to you
- When you play video games with friends

» Artificial Intelligence is not just a technology.

» It is a powerful tool that helps us solve big problems, makes our lives easier, and creates new opportunities.

« **لماذا الذكاء الاصطناعي مهم لنا اليوم؟**

« الذكاء الاصطناعي موجود في كل مكان حولنا: عندما يبحث جوجل عن إجابتك، وعندما يقترح عليكم "فيس بوك" منتجًا جديدًا، وعندما تلعب أنت وأصدقاؤك ألعاب الفيديو.

« الذكاء الاصطناعي قوة هائلة، فهو ليس مجرد تقنية، بل هو أداة يمكن أن تساعدنا في حل مشكلات كبيرة، وتجعل حياتنا أسهل، بل تفتح فرصًا جديدة.

Artificial Intelligence in our Daily Lives

AI is everywhere around us:

In Smartphones:

- Phone camera that automatically improves photos.
- Applications that translate texts instantly.

- Image Recognition: Your smartphone can recognize your face to unlock!
- Voice assistants: such as Siri, Alexa, and Google Assistant use natural language processing (NLP) to:

1. Understand your speech.
2. Convert voice to text.
3. Analyze the meaning and respond to your requests or questions.

الذكاء الاصطناعي في حياتنا اليومية:

» في الهواتف: • كاميرا الهاتف التي تحسن الصور تلقائيًا.

- التطبيقات التي تترجم النصوص فورًا.
- التعرف على الصور: هاتفك الذكي يستطيع التعرف على وجهك لفتح القفل!
- المساعدات الصوتية (سيري وأليكسا ومساعد جوجل) تستخدم تقنيات معالجة اللغة الطبيعية لفهم كلامك، وتحويل الصوت إلى نص، وتحليل المعنى لتنفيذ طلبك أو إجابة أسئلتك.

In Video Games:

- Smart competitors in video games.
- Personalized tips to improve your performance.
- Non-Player Characters (NPCs) use AI to make complex decisions such as:

1. Choosing the best strategy to attack or escape
2. Learning from your playing style to make the game more challenging.

» في الألعاب:

- الخصوم الأذكياء في ألعاب الفيديو.
- النصائح المخصصة لتحسين أدائك.
- الشخصيات غير القابلة للَّعب تستخدم الذكاء الاصطناعي لاتخاذ قرارات معقدة، مثل اختيار أفضل إستراتيجية للهجوم أو الهروب، والتعلم من أسلوب لعبك لتصبح أكثر تحديًا.

GPT and Language Models:

- Applications like ChatGPT can now conduct natural conversations and help you with your school homework!

» GPT و النماذج اللغوية:

- تطبيقات مثل ChatGPT تستطيع الآن إجراء محادثات طبيعية ومساعدتكم في الواجبات المدرسية!

In Entertainment:

- Watch IT: Suggests movies based on your previous watching.
- Spotify: Discovers songs you will like and creates playlists for you.

» في الترفيه:

- Watch IT: يقترح عليك الأفلام المناسبة بناءً على ما شاهدته سابقًا.
- Spotify: يكتشف الأغاني التي ستحبها ويقوم بتنظيم قوائم موسيقية مخصصة لك.

At Home:

- Smart devices that control lighting
- Smart vacuum cleaners

» في المنزل:

- الأجهزة الذكية التي تتحكم في الإضاءة .
- المكانس الكهربائية الذكية.

In transportation:

- Self-Driving Cars: Cars that drive themselves!

» في مجال النقل: السيارات ذاتية القيادة: السيارات التي تقود نفسها بنفسها!

أهم الكلمات والمصطلحات			
Artificial Intelligence (AI)	الذكاء الاصطناعي	Facial Recognition	التعرف على الوجه
Simulate	يُحاكي / يُقلد	Natural Language	اللغة الطبيعية
Patterns	أنماط	Self-Driving Cars	السيارات ذاتية القيادة
Data Processing	معالجة البيانات	Personalized Content	محتوى مخصص
Decision Making	اتخاذ القرار	Abilities	القدرات
Voice Assistants	المساعِدات الصوتية	Digital Brain	دماغ رقمي
Innovation	ابتكار	Self-Awareness	الوعي الذاتي

Exercises on Lesson 2

1 Choose the correct answer:

1 Artificial Intelligence is: ....

a. The ability of the machine to feel.

b. The ability of the machine to "think" and make a decision.

c. The ability of human to control the computer.

d. A program for displaying images.

2 Smart characters in games that interact and adapt with you are an example of ....

a. human intelligence

b. manual programming

c. Artificial Intelligence

d. mechanical parts

3 From the examples of using AI in mobile phones: ....

A. Writing messages only.

b. Playing songs.

c. Facial recognition.

d. Opening the camera manually.

4 .... use natural language processing (NLP) to understand your speech.

a. Smart vacuums

b. Self-driving cars

c. Smart lighting

d. Voice assistants

5 Which of the following is an ability of human intelligence ?

a. Creativity and innovation.

b. Pattern recognition.

c. Speed of data processing.

d. Analyzing big data.

6 A smartphone camera uses AI to ....

a. print photos.

b. automatically improve photos

c. charge the battery.

d. record physical touch.

7 Games use Artificial Intelligence in: ....

a. Displaying backgrounds.

b. Moving the character in a fixed way.

c. Making characters adapt to the player's style.

d. Increasing the number of players.

8 .... can conduct natural conversations and help you with school homework.

a. Smart vacuums b. ChatGPT c. Self-driving cars d. Spotify

9 From the examples of using AI on the Internet: ....

a. Changing the screen color. b. Suggesting appropriate content.

c. Blocking the Internet. d. Increasing browser speed.

10 Artificial Intelligence is defined as the ability of computer systems to .... human abilities.

a. simulate b. replace c. ignore d. destroy

11 Artificial Intelligence is characterized by ....

a. Having feelings. b. Understanding sarcasm.

c. having self-awareness. d. Processing data at super speed.

12 In entertainment, AI platforms like .... discover songs you will like.

a. Facebook b. ChatGPT c. Spotify d. Siri

13 Siri is an example of: ....

a. Image processing. b. A voice assistant based on AI.

c. A drawing program. d. An Internet browser.

14 What is artificial intelligence unable to do yet?

a. Analyzing images. b. Learning from data.

c. Feeling the beauty of a painting. d. Recognizing voices.

15 From the abilities of Artificial Intelligence: ....

a. Understanding deep social relationships.

b. Making decisions based on data.

c. Feeling sadness and joy.

d. Free artistic creativity.

16 (📖) Self-driving cars are an example of:

a. Artificial Intelligence in homes.

b. Artificial Intelligence in education.

c. Artificial Intelligence in transportation.

d. Artificial Intelligence in medicine.

2 Put (✓) or (✗):

1 (📖) Artificial Intelligence can feel human emotions. ( )

2 AI makes machines act as if they are thinking. ( )

3 (📖) Artificial Intelligence relies on processing data only without self-awareness. ( )

4 AI feel complex emotions like joy, sadness, love, and empathy. ( )

5 Video games use AI to make competitors act more intelligently. ( )

6 (📖) Characters in video games can learn from the user's play style. ( )

7 Voice assistants like Siri and Alexa use Natural Language Processing (NLP). ( )

8 (📖) Human intelligence have creativity while Artificial Intelligence imitates and does not innovate. ( )

9 AI processes information much slower than the human brain. ( )

10 (📖) The phone camera that improves photos automatically uses Artificial Intelligence. ( )

11 AI can understand the deep "feeling" of a piece of music. ( )

12 Smart vacuum cleaners are an example of AI used at home. ( )

13 (📖) Smart search engines like Google do not rely on Artificial Intelligence. ( )

14 Non-Player Characters (NPCs) in games can learn from your playing style. ( )

15 Artificial Intelligence can understand sarcasm and emotions with the same accuracy as humans. ( )

16 AI makes decisions based on data and rules, not feelings. ( )

17 Robots can be programmed to make decisions based on data. ( )

18 Smart devices in homes such as smart vacuum cleaners rely on AI. ( )

3 Complete the following sentences:

1 .... allows machines to act as if they are thinking and interacting like humans

2 Voice assistants like ....,.................... and .... use Nature Language Processing to understand what you say.

3 A smart .... uses AI to navigate your home and clean the floors automatically.

4 .... is an example of language module s, It can help you in your school work .

5 Apps like Spotify and watch it use AI to give you personalized .... based on what you like.

6 A car that can navigate roads and drive itself without a human is called a ....

Test Yourself on Lessons 1&2

1 Choose the correct answer:

1. .... is the scientist who created a test to see if a machine is intelligent
   a. Isaac Newton b. Albert Einstein
   c. Alan Turing d. Al-Khwarizmi
2. Human intelligence is different from AI because humans have ....
   a. No feelings b. Pure data processing
   c. Self-awareness d. Programmed rules
3. Self-driving cars are a great example of AI in the field of: ....
   a. Medicine b. Education c. Entertainment d. Transportation
4. .... is an advanced type of Machine Learning that mimics the human brain.
   a. Deep Learning b. Expert system
   c. Ancient myth d. Manual script
5. the term "Artificial Intelligence" officially born for the first time in ....
   a. 1940 b. 1956 c. 1990 d. 2010
6. The "digital brain" of a machine is designed to process information ....
   a. emotionally b. slowly c. very quickly d. none of them
7. AI helps us solve big problems and creates new ....
   a. feelings b. opportunities
   c. emotions d. biological cells

2 Put (✓) or (✗):

1. The idea of AI appeared only in the last 5 years. (   )
2. Machine Learning allows computers to learn from experience and data. (   )
3. AI has self-awareness just like humans. (   )
4. Humans are better than AI at understanding deep sarcasm and jokes. (   )
5. AI is only used in robots and cannot be found in mobile phones. (   )
6. AI makes decisions based on data and programmed rules, not on feelings. (   )
7. Deep Learning means computer learns from mistakes. (   )
8. Early AI computers were very fast and had huge memory. (   )

Lesson 3

AI Is Everywhere Around Us

- In previous lessons, we studied some examples of Artificial Intelligence in our daily lives.
- In this lesson, we will learn important rules to use AI safely and responsibly.

• درسنا في الدروس السابقة بعض الأمثلة على الذكاء الاصطناعي في حياتنا اليومية. في هذا الدرس، سنتعلم قواعد مهمة لاستخدام الذكاء الاصطناعي بطريقة آمنة ومسؤولة.

Ethical Responsibility in AI Uses

"With Great Power Comes Great Responsibility".

- Artificial Intelligence is a powerful technology that can change the world for the better.
- However, it must be used wisely, ethically and responsibly to ensure benefit and safety for everyone.
- AI systems should follow the following rules:

المسؤولية الأخلاقية في استخدامات الذكاء الاصطناعي.

• "مع القوة العظيمة تأتي المسؤولية العظيمة".

الذكاء الاصطناعي تكنولوجيا قوية يمكنها تغيير العالم للأفضل، ومع ذلك، يجب استخدامه بحكمة وأخلاق ومسؤولية لضمان تحقيق الفائدة والأمان للجميع. يجب أن تلتزم أنظمة الذكاء الاصطناعي بالقواعد التالية:

1 Fairness and Transparency:

- AI systems should be fair and treat all people equally without discrimination based on race, gender, or religion.
- Justice should be for everyone.

① العدالة والشفافية:

• يجب أن تكون أنظمة الذكاء الاصطناعي عادلة وتتعامل مع جميع الأشخاص بشكل متساوٍ دون تمييز على أساس العِرق أو الجنس أو الدين.

• يجب أن تكون العدالة متاحة للجميع.

2 Privacy and Data Protection:

- Your personal information should always remain safe and protected.
- No one has the right to use your data without your permission.
- Always remember to read privacy settings before using any application or program.

② الخصوصية وحماية البيانات:

- يجب أن تظل معلوماتك الشخصية دائماً آمنة ومحمية، لا يحق لأي شخص استخدام بياناتك دون إذنك.
- تذكَّر دائمًا قراءة إعدادات الخصوصية قبل استخدام أي تطبيق أو برنامج.

3 Human Supervision and Control:

- Artificial Intelligence is a very powerful tool, but it is still a tool controlled by humans.
- Humans set AI goals and create their algorithms
- Important decisions that affect people's lives, such as critical medical decisions, a judicial ruling, or national security decisions, must always be made by humans. Why?
- This is because humans have awareness, ethics, empathy and the ability to understand complex social and cultural situations that AI does not have.
- Humans set the values and principles that AI systems must follow.
- Important decisions must always be made by humans.
- Humans are the leaders and the final decision-makers.

③ الإشراف والتحكم البشري:

- الذكاء الاصطناعي أداة قوية جدًّا، لكنه يظل أداة يتحكم فيها الإنسان.
- البشر هم من يحددون أهداف الذكاء الاصطناعي ويصممون خوارزمياته.
- القرارات المهمة التي تؤثر على حياة الناس، مثل القرارات الطبية الحاسمة أو الأحكام القضائية أو قرارات الأمن القومي، يجب أن يتخذها البشر دائماً. لماذا؟
- لأن البشر يمتلكون الوعي والأخلاق والتعاطف والقدرة على فهم المواقف الاجتماعية والثقافية المعقدة التي لا يمتلكها الذكاء الاصطناعي.
- البشر هم من يضعون القيم والمبادئ التي يجب أن تلتزم بها أنظمة الذكاء الاصطناعي.
- يجب أن تبقى القرارات المهمة دائمًا بيد الإنسان.
- البشر هم القادة وأصحاب القرار النهائي.

4 The Problem of "Bias" in AI:

- If AI systems are trained using incomplete, unfair or biased data, they become "biased" and make unfair decisions.
- For example, if a facial recognition system is trained mainly using faces from one race, it may find it difficult to recognize faces from other races correctly. This is called "bias" in AI.
- To avoid this problem, developers must use high-quality, fair, and diverse data when training AI systems to make sure their results are fair and accurate.

④ مشكلة "التحيز" في الذكاء الاصطناعي:

- إذا تم تدريب أنظمة الذكاء الاصطناعي باستخدام بيانات غير مكتملة أو غير عادلة أو متحيزة، فإنها تصبح "متحيزة" وتتخذ قرارات غير عادلة.
- على سبيل المثال، إذا تم تدريب نظام التعرف على الوجوه باستخدام وجوه من عِرق واحد فقط، فقد يواجه صعوبة في التعرف على وجوه من أعراق أخرى بشكل صحيح. وهذا ما يُسمى "التحيز" في الذكاء الاصطناعي.
- لتجنب هذه المشكلة، يجب على المطورين استخدام بيانات عالية الجودة وعادلة ومتنوعة عند تدريب أنظمة الذكاء الاصطناعي لضمان أن تكون النتائج عادلة ودقيقة.

How to use Artificial Intelligence responsibly?

1. Think Critically: Do not trust everything AI produces automatically.
2. Verify Information: Learn how to ensure the accuracy of information.
3. Use AI responsibly: Use technology to improve your life and the lives of others.

- كيف نستخدم الذكاء الاصطناعي بطريقة مسؤولة؟

1. فكر بشكل نقدي: لا تثق في كل ما ينتجه الذكاء الاصطناعي بشكل تلقائي.
2. تحقق من المعلومات: تعلم كيف تتأكد من صحة المعلومات.
3. استخدم الذكاء الاصطناعي بمسؤولية: استخدم التكنولوجيا لتحسين حياتك وحياة الآخرين.

أهم الكلمات والمصطلحات

Ethical Responsibility	المسؤولية الأخلاقية	Discrimination	التمييز
Fairness	العدالة / الإنصاف	Critical Thinking	التفكير النقدي
Transparency	الشفافية	Verify Information	التحقق من المعلومات
Privacy	الخصوصية	Empathy	التعاطف
Data Protection	حماية البيانات	Social Context	السياق الاجتماعي
Human Supervision	الإشراف البشري	Integrity	النزاهة
Bias	التحيز		

Exercises on Lesson 3

1 Choose the correct answer:

1. What is meant by fairness in AI systems?
   a. Designing systems that work faster.
   b. Designing systems that work without human intervention.
   c. Designing fair systems for all.
   d. Designing systems that monitor all data.

2. The ethical rule that states your data cannot be used without your permission is ....
   a. fairness b. privacy c. responsibility d. transparency

3. Examples of privacy protection include ....
   a. reading privacy settings before using a new app.
   b. sharing your data with any application without review.
   c. sharing all your information on the Internet.
   a. giving your password to a friend.

4. Who makes important decisions in systems based on AI?
   a. Only AI b. Voice assistants.
   c. Humans. d. Robots.

5. .... means you do not trust everything AI produces automatically.
   a. Fast thinking b. Critical thinking
   c. No thinking d. Biased thinking

6. Why should humans make the critical decisions ?
   a. Because AI is slower.
   b. Because AI cannot analyze data.
   c. Because humans do not make mistakes.
   d. Because humans have awareness, ethics, and empathy.

7. AI systems become "biased" when they are trained using ....
   a. too much data b. very fast computers
   c. incomplete or unfair data d. diverse and fair data

8 When does bias occur in Artificial Intelligence?
a. When the data is diverse.
b. When there is a lot of data.
c. When the data is limited or unfair.
d. When the data is updated.

9 If a facial recognition system only recognizes one race, this is an example of ....
a. fairness
b. bias
c. responsibility
d. privacy

10 If a facial recognition system is trained using data from only one race, it will ....
a. work efficiently for everyone.
b. become faster.
c. improve in translation.
d. fail to recognize other races.

11 Humans set the .... that AI systems must follow.
a. colors
b. values and principles
c. weather
d. prices

12 The role of a smart user when dealing with AI is to ....
a. believe everything they see
b. ignore verifying information
c. think critically and verify information
d. use AI only for playing

13 Treating all people equally without discrimination based on race or gender is called ....
a. privacy
b. complexity
c. speed
d. fairness

14 Which of the following is an example of responsible use of AI?
a. Using it to harm others.
b. Using it to improve people's lives.
c. Using it to spread rumors.
d. Using it without reviewing the data.

15 What is element AI does not have that humans have?
a. The ability to feel and understand values.
b. The ability to store data.
c. The ability to learn.
d. The ability to analyze numbers.

16 Responsible AI users should ....
a. think critically
b. verify Information
c. use AI ethically
d. all of them

17 📖 The goal of the "Young AI Innovator" project is: ....

a. Designing games only.

b. Creating AI solutions for real problems.

c. Writing complex codes.

d. Using AI in everything without rules.

2 Put (✓) or (✗):

1 AI is a powerful technology that can improve our lives. ( )

2 📖 AI should be designed to be fair for everyone. ( )

3 Humans have empathy and ethics that AI does not. ( )

4 📖 No one has the right to use your personal data without your permission. ( )

5 📖 AI can make critical decisions better than humans. ( )

6 📖 Humans are the final decision-makers because they have ethics and awareness. ( )

7 Critical thinking means accepting AI results without any questions. ( )

8 📖 Bias in AI may happen due to incomplete or unfair data. ( )

9 National security decisions must always be made by humans. ( )

10 📖 It is safe to trust all AI results without verifying them. ( )

11 Using diverse data helps make AI fairer. ( )

12 Human supervision is not necessary because AI is very powerful. ( )

13 📖 Using AI to improve people's lives is a responsible use of AI. ( )

14 Privacy means that no one should use your data without your permission. ( )

15 📖 Facial recognition is not affected by the quality of data used in training AI. ( )

16 AI can understand complex cultural situations better than humans. ( )

17 📖 One role of the smart AI user is critical thinking and verifying information. ( )

Lesson 4

The Artificial Neuron

» In this lesson, we will learn how AI works and how scientists design simple models for some processes that AI understands.

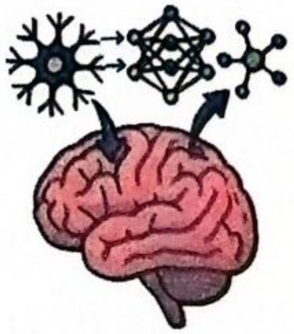
» في هذا الدرس سنتعلم كيف يعمل الذكاء الاصطناعي، وكيف يصمم العلماء نماذج بسيطة لبعض العمليات التي يستطيع الذكاء الاصطناعي فهمها.

1 What is an Artificial Neuron?

Artificial Neuron:

» It is a small unit inside the computer that tries to imitate how humans think and learn.

» هي وحدة صغيرة داخل الكمبيوتر تحاول تقليد طريقة تفكير وتعلم الإنسان.



» In the human brain, there are neurons that help us learn and think.

» Where each neuron receives information from other cells, processes it, and then sends signals to a third set of cells.

» This process helps us understand the world, make decisions, and react to situations.

» Scientists created similar cells inside computers to help machines "think" and make decisions.

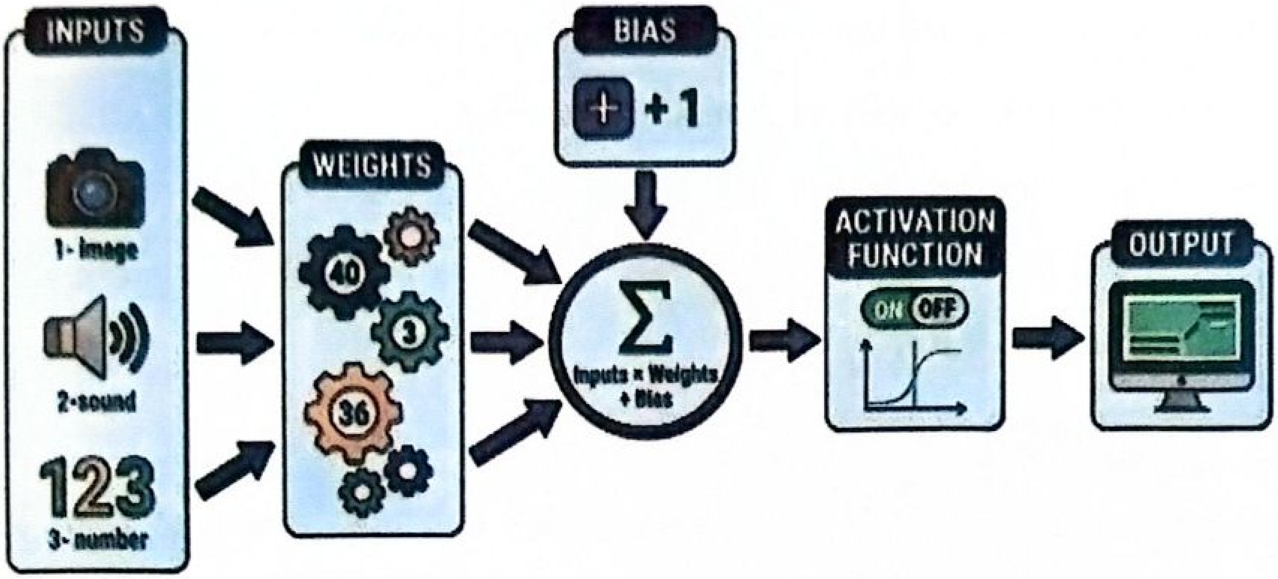
» في دماغ الإنسان خلايا عصبية تساعدنا على التعلم والتفكير، حيث تستقبل كل خلية عصبية معلومات من خلايا أخرى، ثم تعالج هذه المعلومات، وبعد ذلك ترسل إشارات إلى مجموعة أخرى من الخلايا.

» تساعدنا هذه العملية على فهم العالم من حولنا، واتخاذ القرارات، والتعامل مع المواقف المختلفة.

» لذلك قام العلماء بإنشاء خلايا مشابهة داخل أجهزة الكمبيوتر لمساعدة الآلات على "التفكير" واتخاذ القرارات.

2 Components of an Artificial Neuron

- The artificial neuron consists of 5 main parts:



❶ Inputs:

- They are the information that enters the cell such as:

  ① Image ② Sound ③ Number.

① المُدْخَلات: هي المعلومات التي تدخل إلى الخلية، مثل صورة، صوت، رقم.

❷ Weights:

- They are numbers that help the neuron determine the importance of each piece of information.

② الأوزان: هي أرقام تساعد الخلية العصبية على تحديد مدى أهمية كل معلومة تدخل إليها.

❸ Bias:

- It's a number added to the total to adjust the neuron's operation (final result).

Example:

- Imagine a student needs 50 marks to pass, but he was ill during the exam, so the school gave him 5 extra marks as help.
- These extra marks are like Bias; they are added to the result to help the artificial neuron reach the correct decision.

What is the benefit of Bias?

- It makes the neuron more flexible.
- It allows the cell to give results even when inputs are zero.
- It is similar to personal preference that might affect human decisions!

③ **الانحياز:** هو رقم يتم إضافته إلى الناتج النهائي لضبط عمل الخلية العصبية.

مثال: تخيل أن طالبًا يحتاج إلى 50 درجة للنجاح، لكنه كان مريضًا أثناء الامتحان، فقررت المدرسة منحه 5 درجات إضافية كمساعدة.

هذه الدرجات الإضافية تشبه الانحياز (Bias)، حيث يتم إضافتها إلى النتيجة لمساعدة الخلية العصبية الاصطناعية على الوصول إلى القرار الصحيح.

ما فائدة الانحياز؟

- يجعل الخلية العصبية أكثر مرونة.
- يسمح للخلية بإعطاء نتائج حتى عندما تكون المدخلات تساوي صفرًا.
- يشبه التفضيل الشخصي الذي قد يؤثر على قرارات الإنسان.

④ Activation Function:

- It is the part of the artificial neuron that makes the final decision.
- It determines whether the neuron should send a signal or not.
- This decision depends on the calculation result performed by the cell:

Inputs × Weights + Bias

- The activation function works like a switch that turns the neuron on or off.

④ **دالة التنشيط:**

- هي الجزء المسؤول عن اتخاذ القرار النهائي داخل الخلية العصبية الاصطناعية.
- تحدد ما إذا كانت الخلية سترسل إشارة.
- يعتمد هذا القرار على نتيجة العملية الحسابية التالية: (المدخلات × الأوزان + الانحياز)
- تعمل دالة التنشيط مثل مفتاح تشغيل أو إيقاف للخلية العصبية.

Most Famous Types of Activation Functions

Function Name	Usage	Example
❶ Threshold	• A very simple function. • If the value is greater than a specific number, the result = 1. • If the value is less or equal, the result = 0. • دالة بسيطة جدًا. • إذا كانت القيمة أكبر من رقم معين تكون النتيجة = 1 • إذا كانت أقل من أو تساوي هذا الرقم تكون النتيجة = 0	• If the passing grade is 50 out of 100: • If you get 60, it means "Pass". • If you get 40, it means "Fail". » this function Gives Yes or No. إذا كانت درجة النجاح 50 من 100: • إذا حصلت على 60 ← ناجح • إذا حصلت على 40 ← راسب
❷ Sigmoid	• This function doesn't just give "Yes or No". • It gives a ratio or probability between 0 and 1. • لا تعطي إجابة "نعم" أو "لا" فقط. • تعطي نسبة أو احتمال بين 0 و1.	• The computer analyzes an image and says there is an 85% probability that the image is a cat. • If the ratio is high, we trust the decision. • يقوم الكمبيوتر بتحليل صورة ويقول إن احتمال أن تكون الصورة لقطة هو 85%. • كلما زادت النسبة زادت ثقتنا في القرار.
❸ ReLU	• It gives the same value if it's positive. • If it's negative, it changes the value to zero. • تعطي نفس القيمة إذا كانت موجبة. • إذا كانت القيمة سالبة يتم تحويلها إلى صفر. • تحافظ على نفس القيمة للأرقام الموجبة لكنها تغير الأرقام السالبة إلى الصفر.	• A microphone does not record weak sounds. • It only records strong sounds. • It ignores a very weak sound. • It focuses only on positive values. • الميكروفون لا يسجل الأصوات الضعيفة، لكنه يسجل الأصوات القوية فقط، ويتجاهل الأصوات الضعيفة جدًا. هذه الدالة تركز فقط على القيم الموجبة.

❺ Output:

» It is the final result of the artificial neuron.

Example:

» Let's learn how you can calculate school results in subjects (Science, Math, Computer) using a simple artificial neuron model.

❺ المخرجات: هي النتيجة النهائية التي تعطيها الخلية العصبية الاصطناعية.

مثال: سنتعلم كيف يمكن حساب نتيجة الطالب في المواد الدراسية (العلوم – الرياضيات – الكمبيوتر) باستخدام نموذج بسيط لخلية عصبية اصطناعية.

Steps to calculate your result:

❶ Inputs:

» The student's marks are: in Science (8), Math (7), and Computer (6). Each out of 10.

❷ Weights:

» Each subject has a different importance.

» For example: Science = "0.4", Math = "0.3", Computer = "0.3".

❸ Bias: A fixed number (such as 1) is added to improve the result, like attendance or year work.

❹ Calculation Method:

» Multiply each mark by its weight, then add the bias.

» Result = (Science (8) × 0.4) + (Math(7) × 0.3) + (Computer(6) × 0.3) + 1 = 8.1

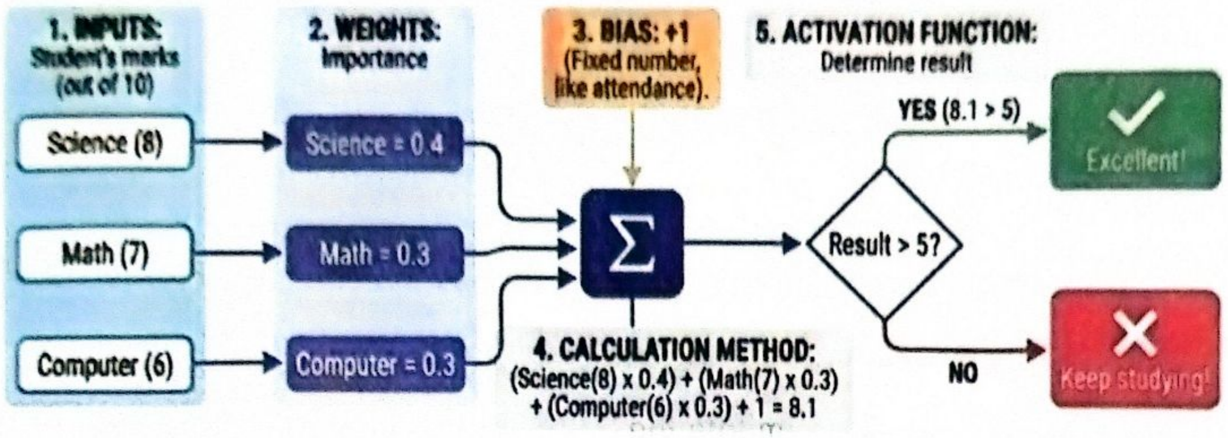
❺ Activation Function:

» To determine if the result is "Weak" or "Excellent!". For example:

» If the result is > 5 → "Excellent!".

» If it is < 5 → "Keep studying!".

As the result is 8.1 → "Excellent!"



Remember:

- AI learns just like you do.
- The harder you work, the better your results will be.

تذكر دائمًا أن الذكاء الاصطناعي يتعلم مثل الإنسان، فكلما زاد اجتهادك تحسنت نتائجك

أهم الكلمات والمصطلحات			
Artificial Neuron	خلية عصبية اصطناعية	Sigmoid	دالة الاحتمال (نسبة مئوية)
Inputs	مدخلات (المعلومات الداخلة)	ReLU	تفعيل القيم الموجبة
Weights	أوزان (أهمية المعلومة)	Probability	احتمال
Bias	انحياز (رقم إضافي للمساعدة)	Flexibility	مرونة
Activation Function	دالة التنشيط (صانعة القرار)	Output	مخرج (الناتج النهائي)
Threshold	الحد الفاصل (نعم أو لا)		

Exercises on Lesson 4

1 Choose the correct answer:

1 What is an Artificial Neuron?

a. A program for running games.

b. A unit that tries to imitate the way humans think.

c. A part of the computer's memory.

d. A real biological cell.

2 What is the function of Inputs in an artificial neuron?

a. Saving results.

b. Sending decisions.

c. Receiving information.

d. Deleting data.

3 Weights are used to ....

a. determine the importance of each piece of information.

b. decorate data.

c. store sounds.

d. run the activation function.

4 The activation function works like a .... that turns the neuron on or off.

a. router

b. switch

c. cable

d. battery

5 Bias is similar to ....

a. deleting a mark.

b. increasing a small number to help the cell.

c. doubling data.

d. reducing weights.

6 Calculation in a neuron is performed by the formula: (Inputs × Weights) + ...

a. Output

b. Ratio

c. Activation

d. Bias

7 One of the functions of Bias is that ....

a. it reduces the accuracy of the cell. b. it prevents the cell from working.

c. it makes the cell more flexible. d. it cancels the use of inputs.

8 What is the function of the Activation Function?

a. Managing memory. b. Calculating weights.

c. Storing data. d. Making the final decision.

9 The .... function gives the same value if it's positive but changes negative values to zero.

a. ReLU b. Sigmoid c. Threshold d. AI

10 The Threshold function works as a/an ....

a. probability.

b. On/Off switch based on a certain limit.

c. color scale.

d. audio system.

11 A student needing 5 extra marks as help to pass is an example of ....

a. Weights b. Bias c. Outputs d. ReLU

12 The Sigmoid function gives ....

a. a negative number. b. a number between 0 and 1 (probability).

c. a random number. d. a number greater than 100.

13 The Threshold function gives a "Pass" result if the value is .... a specific number.

a. less than b. equal to c. greater than d. both a and b

14 Which part of the cell helps it make a decision even when inputs are zero?

a. Inputs. b. Weights. c. Bias. d. Input function.

15 To determine if a student is "Excellent!" or "Weak", we use the ....

a. activation function b. bias only

c. physical wires d. modem

16 If the computer says there is an 85% probability that an image is a cat, it is using ....

a. ReLU b. Sigmoid c. Threshold d. Wired network

17 📖 In a neuron: What happens after calculating (Inputs × Weights + Bias)?

a. Data is erased. b. It's sent directly to the user.

c. The cell stops working. d. It's passed to the activation function.

18 The final result given by the artificial neuron is called ....

a. Input b. Weight c. Output d. Bias

2 Put (✓) or (✗):

1 Scientists created artificial neurons to help machines make decisions. ( )

2 📖 The artificial neuron tries to imitate the work of neurons in the human brain. ( )

3 📖 Weights in a neuron do not affect the final decision. ( )

4 📖 Bias helps the cell give results even in the absence of inputs. ( )

5 The Sigmoid function only gives a "Yes" or "No" answer. ( )

6 📖 The activation function is responsible for executing the cell's final decision. ( )

7 📖 The Threshold function gives values between 0 and 1 only. ( )

8 In artificial neuron, The formula for calculation is (Inputs + Weights) × Bias. ( )

9 📖 The Sigmoid function is used to give a probability or ratio. ( )

10 Bias makes the artificial neuron more flexible in its decisions. ( )

11 📖 Inputs can be images, sounds, or numbers. ( )

12 If a value is less than the specific number in a Threshold function, the result is 1. ( )

13 📖 Without an activation function, the Neuron will not be able to make a decision. ( )

14 An artificial neuron can give a result even when inputs are zero ( )

15 📖 Weights are always fixed values that do not change. ( )

16 ReLU function focuses only on positive values. ( )

17 📖 Bias has no role in adjusting the cell's performance. ( )

3 Complete the following sentences:

1 An .... is a small unit in a computer that tries to imitate how human brains think

2 Information like images, sounds, or numbers that feed the cell are called ....

3 To determine the importance of each piece of information, the neuron uses ....

4 .... is an extra number added to the calculation to make the neuron more flexible, like giving "bonus marks" to a student.

5 The part of the neuron that acts like a "switch" to make the final decision is called the ....

6 If you want a result that is either "Yes (1)" or "No (0)", you should use the .... function.

7 The correct "Calculation formula" inside a neuron is: (Inputs × Weights) + ...

Test Yourself on Lessons 3&4

1 Choose the correct answer:

1 Fairness in AI means ....

a. Higher system speed. b. No discrimination.

c. Full data monitoring. d. No human control.

2 Important and critical decisions should be made by ....

a. Voice assistants. b. Fast computers.

c. Human beings. d. Smart robots.

3 Fair AI systems should treat people ....

a. Differently b. Equally c. Randomly d. Based on opinions

4 Adding "Bias" to a neuron helps in ....

a. Decreasing accuracy. b. Increasing flexibility.

c. Stopping the cell. d. Deleting the inputs.

5 Which activation function gives only Yes or No results?

a. ReLU b. Sigmoid c. Threshold d. Output

6 Using AI responsibly means using it to ....

a. Harm others b. Spread rumors c. Improve life d. Cheat

7 Privacy means that your personal data should be ....

a. Shared publicly b. Sold online

c. Protected and safe d. Ignored

2 Put (✓) or (✗):

1 Fair AI systems treat all people equally. ( )

2 AI can understand human feelings better than people. ( )

3 Bias can happen when AI is trained using unfair data. ( )

4 The "Threshold" function gives a 1 or 0 result. ( )

5 ReLU changes positive values to zero. ( )

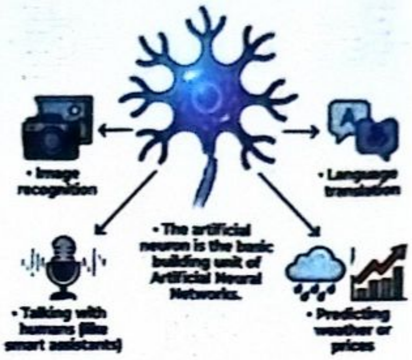
6 If all inputs are zero, a neuron can still give a result. ( )

7 A smart user believes everything AI says ( )

8 AI is a tool, and humans are the ones who control it. ( )

Lesson 5

The Role of the Artificial Neuron in Artificial Intelligence



- In the previous lesson, we studied the components of the artificial neuron and the activation function and its most common types.
- In this lesson, we will learn more about Artificial Neural Networks.
- The artificial neuron is the basic building unit of Artificial Neural Networks.
- The artificial neural networks are used in:
  1. Image recognition.
  2. Language translation
  3. Talking with humans (like smart assistants).
  4. Predicting weather or prices.

- في الدرس السابق، درسنا مكونات الخلية العصبية الاصطناعية ودالة التنشيط وأشهر أنواعها. وفي هذا الدرس، سنتعلم المزيد عن الشبكات العصبية الاصطناعية.
- الخلية العصبية الاصطناعية هي وحدة البناء الأساسية للشبكات العصبية الاصطناعية.
- تُستخدم الشبكات العصبية الاصطناعية في: التعرف على الصور، و الترجمة بين اللغات، و التحدث مع الإنسان (مثل المساعدات الذكية)، والتنبؤ بالطقس أو الأسعار.

1 How do we build an artificial neuron?

To build an artificial neuron, we need to:

1. Identify the type of input data such as: numbers or images.
2. Give a weight to each input
3. Multiply each input by its weight, then add the results together.
4. Send the result to the activation function.
5. Get the final output, which represents the decision or prediction.

① كيف نبني خلية عصبية اصطناعية؟

- لبناء خلية عصبية اصطناعية، نحتاج إلى:

ⓐ تحديد نوع بيانات الإدخال (مثل الأرقام أو الصور).

ⓑ إعطاء وزن لكل مدخل.

ⓒ ضرب كل مدخل في وزنه، ثم جمع النتائج معًا.

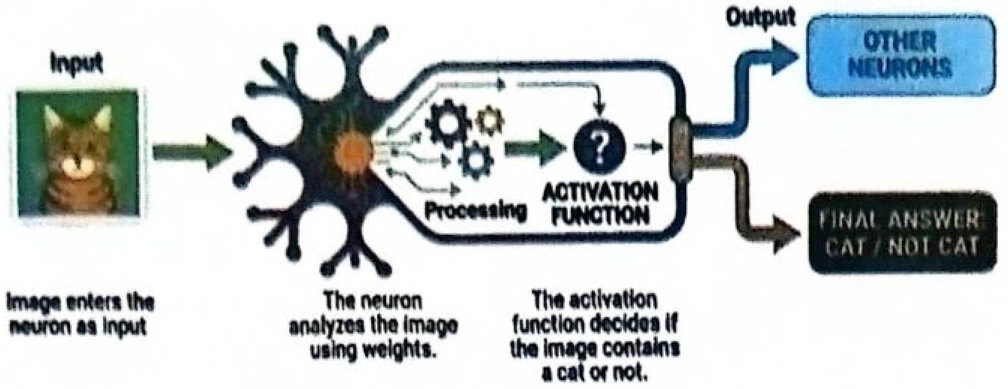
ⓓ إرسال الناتج إلى دالة التنشيط.

ⓔ الحصول على الناتج النهائي الذي يمثل القرار أو التنبؤ.

2 How does an artificial neuron work?

Imagine you want to know if a picture contains a cat or not.

- The image enters the neuron as input.
- The neuron analyzes the image using weights.
- The activation function decides if the image contains a cat or not.
- The neuron sends the result to other neurons or gives the final answer directly.



② كيف تعمل الخلية العصبية الاصطناعية؟

تخيل أنك تريد معرفة هل الصورة تحتوي على **قطة أم لا.**

- تدخل الصورة إلى الخلية العصبية كمدخل.
- تقوم الخلية بتحليل الصورة باستخدام الأوزان.
- تقرر دالة التنشيط ما إذا كانت الصورة **تحتوي على قطة أم لا.**
- ترسل الخلية النتيجة إلى خلايا أخرى أو **تعطي الإجابة النهائية مباشرة.**

3 How are neurons used in Artificial Intelligence?

- When we connect thousands of artificial neurons together, we get a powerful neural network that can:

1. Learn from experiences.
2. Improve its performance over time.
3. Solve complex problems such as self-driving cars or diagnosing diseases.

③ كيف تُستخدم الخلايا العصبية في الذكاء الاصطناعي؟

- عندما نربط آلاف الخلايا العصبية الاصطناعية معًا، نحصل على **شبكة عصبية قوية تستطيع أن:**

1. تتعلم من التجارب.
2. تحسن أداءها مع مرور الوقت.
3. تحل مشكلات معقدة، مثل السيارات ذاتية القيادة **أو تشخيص الأمراض.**

4 Real-life applications of artificial neuron:

1. Smart assistants like Siri and Alexa.
2. Smart cameras that recognize faces.
3. Self-driving cars.
4. Instant translation between languages.
5. Diagnosing diseases in hospitals.
6. Suggesting movies on platforms like YouTube.

» تطبيقات حياتية للخلية العصبية الاصطناعية:

- المساعدات الذكية مثل: سيري (Siri) وأليكسا (Alexa).
- الكاميرات الذكية التي تتعرف على الوجوه.
- السيارات ذاتية القيادة.
- الترجمة الفورية بين اللغات.
- تشخيص الأمراض في المستشفيات.
- اقتراح الأفلام على منصات مثل اليوتيوب.

أهم الكلمات والمصطلحات

Artificial Neuron	خلية عصبية اصطناعية	Image Recognition	التعرف على الصور
Neural Networks	شبكات عصبية	Translation	ترجمة
Inputs	مدخلات	Smart Assistants	مساعدات ذكية
Weights	أوزان	Weather Forecast	التنبؤ بالطقس
Sum / Summation	جمع / عملية الجمع	Self-driving cars	سيارات ذاتية القيادة
Activation Function	دالة التنشيط	Diagnosing diseases	تشخيص الأمراض
Output	مخرج / ناتج نهائي	Face Recognition	التعرف على الوجوه
Prediction	تنبؤ	Suggesting movies	اقتراح الأفلام
Decision	قرار	Experience	خبرة / تجربة
Improvement	تحسين / تطوير	Complex problems	مشكلات معقدة

Exercises on Lesson 5

1 Choose the correct answer:

1 What is the basic building unit of Artificial Neural Networks?

a. Complex algorithms.
b. The artificial neuron.
c. Smart assistants.
d. Instant translation function.

2 Artificial neural networks are used in ....

a. image recognition
b. language translation
c. predicting weather
d. all of them

3 To build an artificial neuron, the first step is to ....

a. identify the type of inputs
b. identify weights
c. use activation function
d. get the final output

4 What is the step that comes after identifying the data type and giving each input a weight when building an artificial neuron?

a. Obtaining the final output.
b. Passing the result to the activation function.
c. Adding the inputs after multiplying them by their weights.
d. Analyzing the image using weights.

5 Smart cameras use artificial neurons to ....

a. recognize faces
b. connect to Wi-Fi
c. convert signals
d. print photos

6 When thousands of artificial neurons are connected, they form a/an ....

a. database
b. operating system
c. neural network
d. software tool

7 What is the main role of the activation function in an artificial neuron?

a. Decide the final decision (Yes/No).
b. Identify weights for each input.
c. Add the weighted inputs.
d. Entering the image as an input.

8 The neuron analyzes the input image using ....

a. storage
b. sensors
c. weights
d. routers

9 When we connect thousands of artificial neurons together, we get a neural network that can solve complex problems such as: ....

a. Writing simple programs.
b. Driving cars or diagnosing diseases.
c. Storing data.
d. Analyzing manual texts only.

10 One real-life applications of artificial neurons related to content suggestion is ....

a. smart assistants like Siri.
b. face recognition cameras
c. suggesting movies on platforms like watch it.
d. self-driving cars.

11 Artificial neurons technology are used in: ....

a. Analyzing fixed product prices.
b. Identifying product prices manually.
c. Displaying a list of all old prices.
d. Predicting the weather or prices.

12 What ability does a powerful neural network gains as a result of learning from experiences?

a. Fixing input weights.
b. Increasing the number of cells in it automatically.
c. Improving itself over time.
d. No need for an activation function.

13 If the neuron is analyzing an image (e.g., a cat), what is the Input that enters the cell?

a. The decision (Yes/No).
b. The image.
c. The final output.
d. The activation function.

14 Which of the following applications is an example of smart assistants that rely on artificial neurons?

a. Smart AC devices.
b. Siri and Alexa.
c. Computer operating systems.
d. Photocopying machines.

15 After the activation function decides the result, what is the next step?

a. Identifying the data type again.
b. Adding the weighted inputs.
c. Giving each input a weight.
d. Sending the result to other cells or gives you the answer directly.

16 The final output of an artificial neuron represents the ....

a. network speed
b. storage capacity
c. decision or prediction
d. input data

2 Put (✓) or (✗):

1 The artificial neuron is the basic building unit of Artificial Neural Networks. ( )

2 Artificial neurons are used only in language translation and weather prediction, and are not used in image recognition. ( )

3 A neural network cannot learn from previous experiences. ( )

4 Identifying the type of input data (such as numbers or images) is the first step in building an artificial neuron. ( )

5 To get the result, we add inputs before multiplying them by weights. ( )

6 Giving a weight to each input is the step that directly comes before sending the result to the activation function. ( )

7 The final goal of an artificial neuron is to obtain the final output which represents a decision or prediction. ( )

8 📖 The activation function analyzes the image using weights in the cat recognition example. ( )

9 Platforms like YouTube use neural networks for features such as suggesting videos. ( )

10 📖 One real-life application of artificial neurons is diagnosing diseases in hospitals. ( )

11 📖 When thousands of neurons are connected together, the network loses its ability to learn from experiences and improve over time. ( )

12 The activation function is responsible for getting the final output. ( )

13 📖 Self-driving cars are not considered complex problems that powerful neural networks can solve. ( )

14 📖 Smart cameras that recognize faces are an example of a real-life application of the artificial neuron. ( )

15 A neuron always gives the final answer and never sends data to other neurons. ( )

16 Improving performance over time is a characteristic of a neural network. ( )

17 The result of multiplying inputs by weights is sent directly as the final output. ( )

Lesson 6

Introduction to Data Analysis Using Python

- In the First Preparatory, we studied the concept of Big Data, some examples of data analysis, and the Python language.
- In this lesson, we will learn how to analyze data using Python.

- في الصف الأول الإعدادي، درسنا مفهوم البيانات الضخمة وبعض أمثلة تحليل البيانات ولغة البرمجة بايثون.
- في هذا الدرس سنتعلم كيفية تحليل البيانات باستخدام بايثون.

Concept and Importance of Data Analysis

Data Analysis:

- It is the process of inspecting, cleaning, and transforming data to extract useful information and make fact-based decisions.

- **تحليل البيانات:** هو عملية فحص وتنظيف وتحويل البيانات لاستخراج معلومات مفيدة واتخاذ قرارات مبنية على حقائق.

Using Python for Data Analysis:

- Python is one of the best programming languages for data analysis because:

1. Easy to learn and use: Its simple syntax makes it suitable for beginners.
2. Powerful libraries such as:
   - Pandas: Used for data processing and manipulation.
   - NumPy: Used for scientific and mathematical calculations.
   - Matplotlib & Seaborn: Used for data visualization (graphs).
3. Large Support Community: Many educational resources are available.
4. Compatibility: Works perfectly with Artificial Intelligence and Machine Learning.

استخدام بايثون في تحليل البيانات:

- تعتبر بايثون واحدة من أفضل لغات البرمجة لتحليل البيانات لأنها:

1. سهلة التعلم والاستخدام: تركيبها البسيط يجعلها مناسبة للمبتدئين.
2. تحتوي على مكتبات قوية مثل:
   - Pandas: تُستخدم لمعالجة البيانات والتعامل معها. • NumPy: تُستخدم في العمليات العلمية والرياضية.
   - Matplotlib و Seaborn: تُستخدم لعرض البيانات بيانيًا (الرسوم البيانية).
3. مجتمع دعم كبير: يوجد العديد من المصادر التعليمية المتاحة.
4. التوافق: تعمل بكفاءة مع الذكاء الاصطناعي وتعلم الآلة.

Basic Concepts in Data Analysis:

❶ Mean:

- It is the sum of values divided by their count.

- **المتوسط الحسابي**: هو مجموع القيم مقسومًا على عددها.

Python Example:

```
1. import numpy as np
2. data = [10, 20, 30, 40, 50]
3. mean = np.mean(data)
4. print("The Mean is :", mean)
```

Code Explanation:

❶ Import numpy as np:

- Calls the NumPy library.
- The shortcut np makes writing easier.

- يستدعي مكتبة NumPy، والاختصار np يجعل الكتابة أسهل.

❷ data = [10, 20, 30, 40, 50]:

- Creates a list containing numbers.
- The list can contain any numbers and does not need to be ordered.

- ينشئ قائمة تحتوي على أرقام. يمكن أن تحتوي القائمة على أي أرقام ولا يشترط ترتيبها.

❸ np.mean( ):

- A ready-made function in NumPy to calculate the mean.
- Manual calculation formula: 10 + 20 + 30 + 40 + 50) / 5 = 30.0 (where 5 is the count of numbers)
- Note: The result is usually a float (decimal), even if the answer is a whole number.

- دالة جاهزة في NumPy لحساب المتوسط الحسابي.
- ملاحظة: الناتج غالبًا يكون عددًا عشريًا حتى لو كانت الإجابة عددًا صحيحًا.

❹ Print ( ):

- It display the result on screen.

- تُستخدم لعرض النتيجة على الشاشة.

❷ Maximum and Minimum Values:

- Max( ): The largest value in the dataset.
- Min( ): The smallest value in the dataset.

Example:

```
maximum = np.max(data)
minimum = np.min(data)

print("the maximum number is: ", maximum)
print("the minimum number is: ", minimum)
```

Types of Data that Can Be Analyzed

1 Numerical Data:

- Integers: Like ages, number of products.
- Decimals: Like weights, prices.

- أعداد صحيحة: مثل الأعمار وعدد المنتجات.
- أعداد عشرية: مثل الأوزان والأسعار.

2 Text Data:

- Texts: like customer comments or articles.
- It can be analyzed using Natural Language Processing (NLP).

- نصوص، مثل تعليقات العملاء أو المقالات.
- يمكن تحليلها باستخدام معالجة اللغة الطبيعية (NLP).

3 Date and Time Data:

- Dates like purchase dates or event schedules.
- It can be analyzed using pandas. to_ datetime( ).

- تواريخ، مثل: تاريخ الشراء أو مواعيد الأحداث.

Example of Date Analysis:

Python - Prep2

```
import pandas as pd
dates = ["2023-01-01", "2023-01-02", "2023-01-03"]
date_series = pd.to_datetime(dates)
print(date_series)
```

Code Explanation:

1. Import pandas as pd:
   - Used to call the pandas library and uses pd as a shortcut.
   - لاستدعاء مكتبة Pandas واستخدام الاختصار pd.
2. dates = ["2023-01-01", "2023-01-02", "2023-01-03"]
   - Create a list stores dates as strings.
   - Here we create a variable that stores in the format "YYYY-MM-DD" (Year-Month-Day).
   - إنشاء قائمة تخزن التواريخ كنصوص بصيغة: سنة- شهر- يوم.

③ date_series = pd.to_datetime(dates):

- We use the function pd.to_datetime () to convert the dates list into a DateTime Series.
- The result will be a DatetimeIndex object that allows performing time operations on it, such as:
  - Extracting the day, month, and year.
  - Calculating the period between two dates.
  - Calculating time differences.
  - Filtering by date.
  - To group by date, such as: total sales per month.
  - Detects incorrect dates such as "2023-13-01".

- تُستخدم الدالة لتحويل قائمة التواريخ إلى سلسلة زمنية (DateTime Series).

الناتج كائن يسمح بإجراء عمليات زمنية مثل:

- استخراج اليوم والشهر والسنة.
- حساب الفترة بين تاريخين.
- حساب الفروق الزمنية.
- تصفية البيانات حسب التاريخ.
- تجميع البيانات حسب التاريخ، مثل إجمالي المبيعات الشهرية.
- اكتشاف التواريخ غير الصحيحة، مثل: 2023-13-01.

④ print(date_series):

- Output the result on screen.

The output:

```
DatetimeIndex(['2023-01-01', '2023-01-02', '2023-01-03'], dtype='datetime64[ns]', freq=None)
```

- This means the data is now ready to be used as dates instead of text.

- لعرض النتيجة على الشاشة s.
- وهذا يعني أن البيانات أصبحت جاهزة للاستخدام كتاريخ بدلًا من نص.

أهم الكلمات والمصطلحات

Data Analysis	تحليل البيانات	Data Visualization	التصور البياني (الرسوم البيانية)
Big Data	البيانات الضخمة	Arithmetic Mean	المتوسط الحسابي
Inspecting	فحص	Numerical Data	بيانات عددية
Cleaning	تنظيف	Integers	أعداد صحيحة
Transforming	تحويل	Decimals (Float)	أعداد عشرية
Fact-based decisions	قرارات مدعومة بالحقائق	NLP	معالجة اللغة الطبيعية
Simple Syntax	كود بسيط	Validation	التحقق من الصحة
Data Manipulation	معالجة البيانات	Ordered	مُرتَّبة
Scientific Calculations	حسابات علمية		

Exercises on Lesson 6

1 Choose the correct answer:

1. Why is Python considered suitable for data analysis?
   a. Because it has powerful libraries like Pandas and NumPy.
   b. Because it is difficult to learn.
   c. Because it does not contain libraries.
   d. Because it only works on phones.

2. .... library is used for data processing and manipulation in Python.
   a. NumPy   b. Matplotlib
   c. Pandas   d. Seaborn

3. Python works perfectly with ....
   a. only databases   b. AI and Machine Learning
   c. hardware only   d. manual calculations

4. What is the function of the NumPy library?
   a. Drawing charts.   b. Dealing with text.
   c. Image analysis.   d. Scientific calculations.

5. All of the following are Python libraries for data analysis EXCEPT ....
   a. Pandas   b. NumPy
   c. Matplotlib   d. Windows

6. Which function finds the largest value in a dataset?
   a. np.max ()   b. np.min()
   c. print()   d. np. mean ()

7. The function np.mean() is used to calculate ....
   a. the largest number.   b. the smallest number.
   c. the mean.   d. summing two lists.

8. The result of np.mean() function is usually a/an ....
   a. text string   b. date format
   c. float   d. integer only

9 In the code "import numpy as np", what does "as np" mean?
a. Deleting the library.
b. Shortcut for the library name to facilitate use.
c. Changing the Python language.
d. Running the library automatically.

10 The .... function divides the sum of values by their count.
a. max( ) b. min( ) c. print( ) d. mean( )

11 The .... function is used to display results on the screen.
a. max( ) b. min( ) c. print( ) d. mean( )

12 The Maximum value (Max) is ....
a. the largest value in the data.
b. the smallest value in the data.
c. the average of values.
d. the result of multiplying values.

13 Which type of data can be analyzed using NLP?
a. Numerical data. b. Images. c. Text. d. Dates only.

14 What is the benefit of pd.to_datetime( )?
a. Converting text into numbers.
b. Converting text dates into a time format.
c. Deleting dates.
d. Sorting data automatically.

15 What is the data type in the list data = [10, 20, 30, 40, 50]?
a. Text data.
b. Date data.
c. Numerical data.
d. Audio data.

16 Which library is used for data visualization in Python?
a. Pandas.
b. NumPy.
c. Datetime.
d. Matplotlib.

17 One advantage of Python in data analysis is ....
a. its limited support resources
b. that it works only offline
c. its large support community
d. that it works only with numbers

2 Put (✓) or (✗):

1. Python is difficult for beginners to learn and use. ( )
2. 📖 Data analysis helps in making fact-based decisions. ( )
3. 📖 Python does not contain libraries to support data analysis. ( )
4. 📖 The Pandas library is used to clean and process data. ( )
5. Seaborn is a library used for scientific calculations. ( )
6. 📖 The np.mean( ) function is used to find the smallest value in a list. ( )
7. Numerical data includes integers and decimals. ( )
8. 📖 The mean can be calculated manually without NumPy. ( )
9. To calculate the mean, the list of numbers must be ordered. ( )
10. The result of calculating the mean is usually a decimal number. ( )
11. 📖 Text data can never be analyzed. ( )
12. Min( ) is the function used to find the smallest value in a dataset. ( )
13. 📖 pd.to_datetime( ) can reject invalid dates like "2023-13-01". ( )
14. Weights and prices are examples of integer numerical data. ( )
15. 📖 The Maximum value (Max) is the smallest value in the data. ( )
16. Text data includes articles and customer comments. ( )
17. 📖 The arithmetic mean produces a decimal number even if the results are whole numbers. ( )
18. NumPy is used to calculate the time difference between two dates. ( )
19. 📖 Python can be used to analyze date and time data. ( )
20. The print() function is used to display results on screen. ( )

Test Yourself on Lessons 5&6

1 Choose the correct answer:

1. .... is the basic building unit of Neural Networks.
   a. Instant translation. b. The artificial neuron.
   c. Screen brightness. d. Manual data entry.
2. Which part acts as the "Decision-Maker" in a neuron?
   a. Input data. b. Weight value.
   c. Activation function. d. Summing unit.
3. .... library is used for math and scientific calculations.
   a. Matplotlib. b. NumPy. c. Datetime. d. Seaborn.
4. .... library is used to create "Pie" or "Bar" charts.
   a. Pandas. b. NumPy. c. Matplotlib. d. NLP.
5. When thousands of artificial neurons are connected, they form a/an ....
   a. database b. operating system
   c. neural network d. software tool
6. All of the following are Python libraries for data analysis EXCEPT ....
   a. Pandas b. NumPy c. Matplotlib d. Paint
7. The neuron analyzes the input image using ....
   a. storage b. sensors c. weights d. routers

2 Put (✓) or (✗):

1. Neural networks lose their ability to learn over time. ( )
2. The function np.mean( ) is used to find the smallest value of a list. ( )
3. pd.to_datetime( ) can reject invalid dates like "2023-13-01". ( )
4. Natural Language Processing is used to analyze numbers. ( )
5. Data analysis helps us make decisions based on facts. ( )
6. The neuron may send the result to other neurons. ( )
7. Smart assistants like Siri do not use artificial neurons. ( )
8. The activation function's role is to identify the type of input data. ( )

Summary of Unit 3

Lesson 1

1 The Dream of Thinking Machines that operating automatically.

- Ancient civilizations made efforts to invent "thinking machines" and build machines work on their own (Automation systems).
- These efforts were not AI as we know today

2 The Modern Era of Artificial Intelligence.

1 Alan Turing (The Father of AI):

- In 1950, he founded modern AI and asked, "Can machines think?"
- The Turing Test: if a person chatting via text cannot tell if they are talking to a human or a computer, the program passes the test.

2 The Dartmouth Conference (1956):

- A gathering of the smartest scientists met in USA.
  - The Goal: To develop machines that could learn and think like humans.
  - The Result: The term "Artificial Intelligence" was officially born here.

3 Years of Excitement and Great Hopes (1956 - 1970)

- Scientists created the first AI programs

  1- Logic Theorist: Solve logical mathematical problems.

  2- General Problem Solver: try to solve general problems step-by-step.

- Early Challenges: Computers were very slow with limited memory; they need hours to solve a simple math problem.

4 Expert Systems: Learning from Experts (1970 - 1980)

- Scientists decided to teach machines special knowledge from experts.

- MYCIN (The Robot Doctor): A famous system used to diagnose infectious diseases.
  - It asked questions about symptoms (like fever).
  - It suggested treatments with accuracy as good as expert doctors.

5 AI Winter: When Dreams Faded (1980 - 1990):

- AI faced a major crisis, and the great initial excitement turned into disappointment due to:
  - Overstated Promises: Scientists promised more than they could deliver.
  - Technical Limitations: Computers were still slow and had limited memory.
  - High Cost: Developing these systems was very expensive.
  - Limited Results: Programs only worked in very narrow fields.
  - Lesson learned: Scientists learned that AI is harder than they thought and requires patience.

6 The Renaissance: The Return of Hope (1990 - 2010)

- The Internet & Data Revolution: The appearance of the Internet provided huge amounts of data.
- Machine Learning: A new way where machines learn for themselves from data.
- Amazing Achievements: The computer beat the world chess champion, for the first time

7 The Modern Revolution: Deep Learning (2010 - Now)

- Deep Learning: An advanced type of Machine Learning that mimics the human brain using Artificial Neural Networks (interconnected "neurons" that send and receive signals).
- AlphaGo Success: A computer won against the world champion in "AlphaGo", a Chinese game much more complex than chess.

Lesson 2

» AI Examples in Daily Life:

- In Your Phone: Voice assistants, facial recognition, and text prediction.
- In Games: Smart characters that interact and adapt with you.
- On the Internet: Smart search engines and personalized content suggestions.

» Artificial Intelligence: It is the ability of machines to "think," make decisions, and solve problems.

Or It is the ability of computer systems to simulate human abilities, such as:

- Learning from data.
- Solving problems.
- Recognizing patterns.
- Making decisions.
- Understanding natural language.

» Deeper Understanding of AI: AI can process huge amounts of data very quickly and search for relationships to make logical decisions.

» Comparison between Human Intelligence and Artificial Intelligence:

Artificial Intelligence	Human Intelligence
Pure Data Processing: No feelings, no emotions, and no self-awareness	Humans feel emotions like joy, sadness, love, and empathy.
Super Speed & Accuracy: It processes trillions of data points in seconds with high accuracy.	Humans create new ideas and solve problems in untraditional ways.
Logic and Pure Data: Decisions are based on programmed rules and data.	Humans understand jokes, sarcasm, hidden and complex social situations.

- Why is AI Important Today?
  - AI is a powerful tool that solves big problems and makes life easier.
- Examples of AI in Our Daily Lives:
  - Language Models (GPT): Programs can conduct natural conversations and assist with school homework. (Such as Chat GPT).
  - Smart Phones: Improving photos automatically and instant text translation and image recognition.
  - Voice Assistants: Siri, Alexa, and Google Assistant use Natural Language Processing to understand speech, convert voice to text, and execute requests.
  - Games: Enemies that react intelligently to your movements and personalized tips to improve your skills.

  Non-Player Characters (NPCs) use AI to choose the best strategies to attack or escape, learning from your moves to become more challenging.
  - Entertainment:
  - Watch IT: Suggests movies based on your watch history.
  - Spotify: Discovers songs you like and organizes personalized playlists.
  - At Home: 1- Smart lighting systems. 2- Smart vacuum.
  - Self-Driving Cars: Vehicles that can drive themselves.

Lesson 3

- **Ethical Responsibility in AI Uses:** AI is a powerful technology can change the world for the better, but it must be used wisely, ethically and responsibly to ensure safety for everyone.
- AI systems should follow the following rules:

1. Fairness and Transparency: AI systems should be fair and treat all people equally without discrimination based on race, gender, or religion (Justice for all).

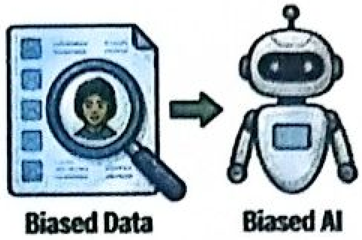
2 Privacy and Data Protection: Personal information must remain safe. No one has the right to use your data without your permission. read the privacy settings of any application you use.

3 Human Supervision and Control:

AI is powerful, but it is still a tool that must be controlled by humans.

- Humans Set the Goals and create the algorithms.
- Important decisions that affect people's lives, such as:
  ❶ Critical medical decisions.
  ❷ Judicial rulings.
  ❸ National security.
- These must always be made by humans because humans have:
  ❶ Awareness. ❷ Ethics. ❸ Empathy.
  ❹ The ability to understand complex social cultural situations.
- Humans set the values and principles that AI systems must follow.
- Humans are the leaders and the final decision-makers.

4 The Problem of Bias in AI:



- Bias happens when an AI system "learns" unfair patterns from the data it is given.
- If a system is trained on incomplete or unfair data, its decisions will be biased.
- Developers must use high-quality, fair, and diverse data when training AI systems to ensure fairness and accuracy in AI results.

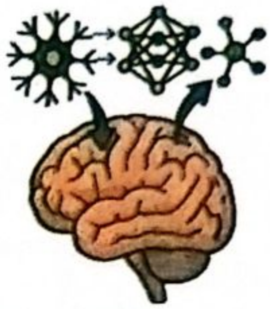
›› How to be a Responsible "Smart User"

1 Think Critically: Do not trust everything AI produces automatically.

2 Verify Information: Learn how to ensure the accuracy of information.

3 Use AI responsibly: Use technology to improve your life and the lives of others.

Lesson 4



- Scientists created Artificial Neurons inside computers to help machines "think" and make decisions.
- Artificial Neuron: It is a small unit inside the computer that tries to imitate how humans think and learn.
- Components of an Artificial Neuron : It consists of 5 main parts:
  1. Inputs: The data that enters the cell (e.g., image, sound, or number).
  2. Weights: Numbers that help the neuron determine the importance of each piece of information.
  3. Bias: A number added to the total to adjust the final result.
     - Benefits: It makes the neuron more flexible. It allows the cell to produce results even if inputs are zero.
  4. Activation Function:
     - This is the "Decision Maker."
     - It calculates the sum of (Inputs × Weights + Bias).
     - It decides whether the cell should send a signal (Turn ON) or not.
  5. Output: The final result or signal sent out by the neuron.
- Most Famous Activation Functions:

Name	Function	Example
Threshold	• It tells the cell: If the value is greater than a certain number, the result = 1. If it is less or equal, the result = 0	• Imagine an exam out of 100, and passing is 50. If you get 60, "Pass" - if you get 40, "Fail". • It Gives Yes or No.
Sigmoid	• This function gives a ratio or probability between 0 and 1	• The computer analyzes an image and says: "Probability this is a cat 85%. If the ratio is high, we trust the decision. • It Gives ratio or probability.
ReLU	• It gives the same value if it's positive but if it's negative, it change it to zero.	• A strong sound is recorded. • a very weak sound is ignored.

Lesson 5

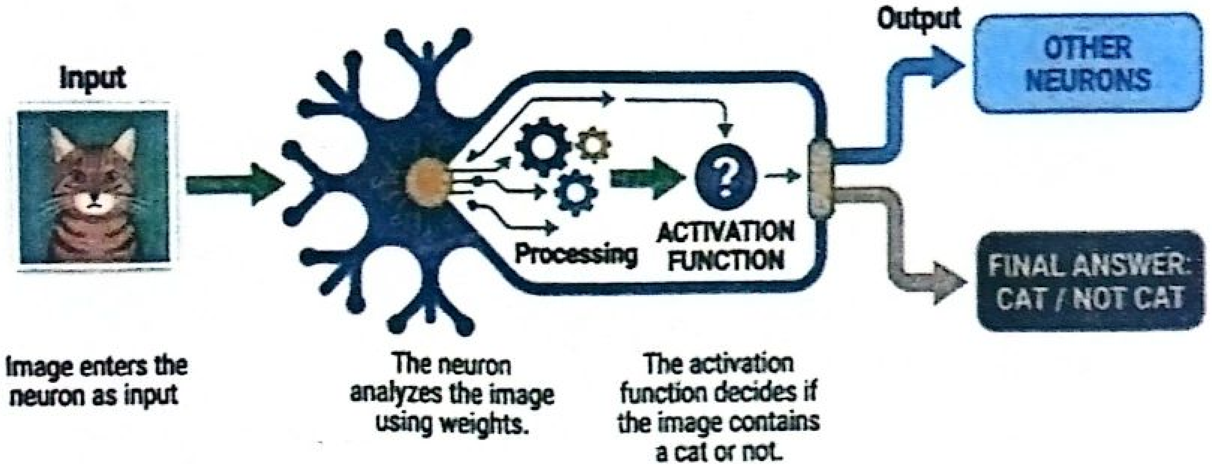
Artificial Neural Networks (ANNs):

- The power the most advanced AI today.

How to Build an Artificial Neuron:

- To build an artificial neuron, we need to:

1. Identify the type of input data (such as numbers or images).
2. Give a weight to each input
3. Multiply each input by its weight, then add the results together.
4. Send the result to the activation function
5. Get the final output, which represents the decision or prediction.



How are neurons used in Artificial Intelligence ?

- When we connect thousands of artificial neurons together, we get a powerful neural network that can:

1. Learn from experiences.
2. Improve its performance over time.
3. Solve complex problems such as self-driving cars or diagnosing diseases.

Real-Life applications of artificial neuron:

- Smart assistants like Siri and Alexa
- Smart cameras that recognize faces.
- Self-driving cars.
- Instant translation between languages.
- Diagnosing diseases in hospitals.
- Suggesting movies on platforms like YouTube.

Lesson 6

Data Analysis: It is the process of inspecting, cleaning, and transforming data to extract useful information and make fact-based decisions.

Using Python for Data Analysis:

- Python is one of the best programming languages for data analysis because:

1. Easy to learn and use: Its simple syntax makes it suitable for beginners.
2. Powerful libraries such as:
   - Pandas: Used for data processing and manipulation.
   - NumPy: Used for scientific and mathematical calculations.
   - Matplotlib & Seaborn: Used for data visualization (graphs).
3. Large Support Community: Many educational resources are available.
4. Compatibility: Works perfectly with AI and Machine Learning.

Basic Concepts in Data Analysis:

1. Mean (Average): It is the sum of values divided by their count.
   - Python Example using NumPy:

```
import numpy as np
data = [10, 20, 30, 40, 50]
mean = np.mean(data)
print("The Mean is :", mean)
```

- Note: The result is usually a float (decimal number), even if the result is a whole number.

2 Maximum and Minimum Values:

- Max ( ): The largest value in the dataset.
- Min ( ): The smallest value in the dataset.

Python Example:

maximum = np.max(data).

minimum = np.min(data).

3 Types of Data can be Analyzed:

1- Numerical Data:

- Integers: Whole numbers (e.g., age, product count).
- Decimals: Numbers with fractions (e.g., weight, price).

2- Text Data: Comments or articles, analyzed using ULP.

3- Date and Time: Specific dates analyzed using the Pandas library.

4 Data Analysis with Pandas:

- To perform operations like calculating the time between two events, text dates must be converted into DateTime objects.
- Python Example:

Python Prep2

```
import pandas as pd
dates = ["2023-01-01", "2023-01-02", "2023-01-03"]
date_series = pd.to_datetime(dates)
print(date_series)
```

Why use pd.to_datetime( )?

- Time Operations: They allow you to calculate the period between dates or extract specific parts (Day, Month, Year).
- Data Validation:

  It automatically rejects incorrect dates (like "2023-13-01") that don't exist.
- Grouping: It helps group data (e.g., calculating total sales per month).

Revision on Unit 3

Model Exam 1

1 Choose the correct answer:

1 .... is used to clean and process data in Python.
a. Pandas b. Matplotlib c. NumPy d. ReLU

2 The term "Artificial Intelligence" was officially introduced during the .... Conference.
a. Dartmouth b. London c. New York d. Oxford

3 .... is the basic unit for building Artificial Neural Networks.
a. Complex algorithm b. The artificial neuron
c. Smart assistant d. Image

4 The result of the np.mean() function in Python is usually a/an ....
a. float (decimal) b. text string
c. integer only d. date format

5 .... is the first step in building an artificial neuron.
a. Summing inputs b. Passing to function
c. Identifying data type d. Output

6 The function np.mean( ) is used to calculate the ....
a. largest number b. smallest number
c. arithmetic mean d. summing lists

7 .... library is used for scientific calculations.
a. NumPy b. Seaborn c. Matplotlib d. Pandas

2 Put (✓) or (✗):

1 Data analysis helps in making fact-based decisions. ( )

2 Artificial intelligence is a brand-new idea that started in 2024. ( )

3 Humans are the final decision-makers because they have ethics and awareness. ( )

4. Artificial neurons are used only in translation and not in image recognition. ( )
5. The activation function acts like a switch to make the final decision. ( )
6. AI can understand human emotions like joy and sadness perfectly. ( )
7. Python does not contain libraries to support data analysis. ( )
8. Smart cameras that recognize faces are a real-life application of neurons. ( )

Model Exam 2

1 Choose the correct answer:

1. The function pd.to_datetime() is used to convert text into ....
   - a. numbers
   - b. time format
   - c. images
   - d. sounds
2. .... library is used for data visualization.
   - a. Pandas
   - b. NumPy
   - c. Matplotlib
   - d. Datetime
3. The maximum value (Max) is the ....
   - a. smallest value
   - b. average
   - c. largest value in data
   - d. sum
4. The .... is a small unit designed to imitate how human brain cells learn and process information.
   - a. artificial neuron
   - b. modem
   - c. router
   - d. wireless Network
5. The "Robot Doctor" program designed in the 1970s to diagnose infectious diseases was called ....
   - a. Logic Theorist
   - b. AlphaGo
   - c. MYCIN
   - d. Siri

6 The primary role of the activation function is ....

a. summing inputs
b. deciding the final result
c. identifying data
d. entry

7 One of the real-life applications of neurons for content suggestion is ....

a. Siri
b. face recognition
c. suggesting videos on YouTube
d. self-driving cars

2 Put (✓) or (✗):

1 pd.to_datetime( ) can reject invalid dates like "2023-13-01". ( )

2 When connecting thousands of neurons, the network loses its ability to learn. ( )

3 The mean() function produces a decimal number even if the results are whole. ( )

4 Early AI programs like Logic Theorist were extremely complex and fast. ( )

5 ReLU function focuses only on positive values and turns negative ones to zero. ( )

6 Natural Language Processing (NLP) is used to analyze numerical data. ( )

7 The np.max( ) function is used to find the smallest value in a list. ( )

8 Self-driving cars are not considered among the complex problems AI solves. ( )

Model Exam 3

1 Choose the correct answer:

1. The .... function gives a number between 0 and 1 to represent probability.
   a. ReLU   b. Sigmoid
   c. Threshold   d. Bias
2. .... is/are an example of smart assistants.
   a. Google Chrome   b. Siri and Alexa
   c. Word   d. Netflix
3. The function np.min(data) returns ....
   a. the largest value   b. the sum
   c. the smallest value   d. the mean
4. A period of disappointment in the 1980s where AI progress slowed down is known as ....
   a. AI Summer   b. AI Winter
   c. AI Renaissance   d. AI Revolution
5. Modern AI systems like Siri use .... to understand human speech.
   a. Natural Language Processing (NLP)
   b. Manual typing
   c. Binary only
   d. Max functions
6. The part of the neuron that determines the importance of each piece of information is the ....
   a. input   b. output
   c. weight   d. router
7. Treating all people equally without discrimination in AI is called ....
   a. privacy   b. fairness
   c. bias   d. complexity

2 Put (✓) or (✗):

1. The artificial neuron is the basic unit of Artificial Neural Networks. ( )
2. Spotify uses AI to discover songs that the user might like. ( )
3. One of the real-life applications of neurons is diagnosing diseases. ( )
4. Artificial Intelligence has self-awareness and feelings just like humans. ( )
5. Neural networks can solve complex problems like driving cars. ( )
6. Data analysis only means deleting data. ( )
7. When we connect thousands of neurons, we get a powerful neural network. ( )
8. Weights help the neuron determine the importance of each piece of input data. ( )

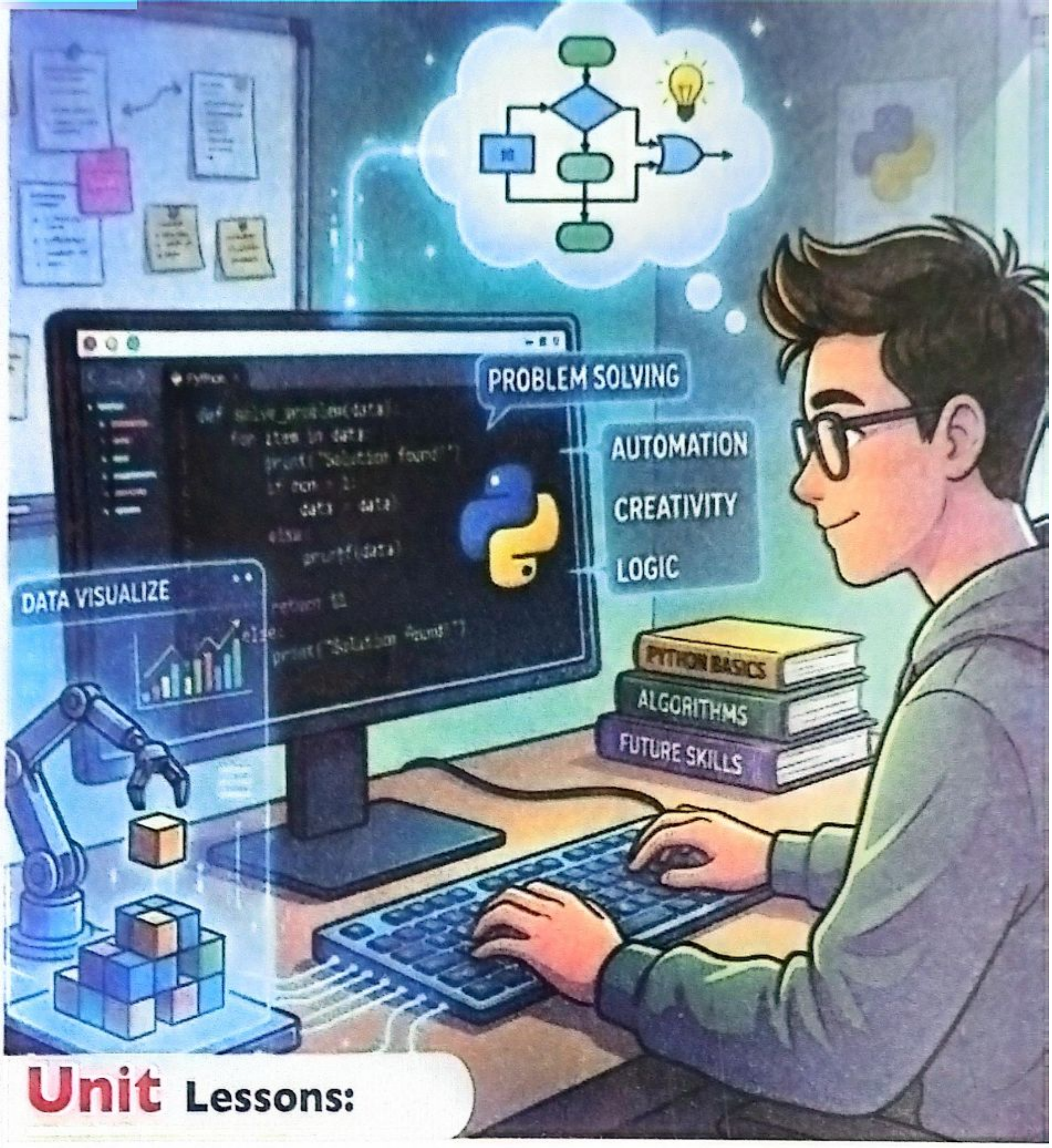
Model Exam 4

1 Choose the correct answer:

1. What is the definition of Data Analysis?
   - a. Deleting data
   - b. Inspecting, cleaning, and transforming data
   - c. Printing
   - d. Copying
2. After the activation function decides (Yes/No), what is the next step?
   - a. Identifying data again
   - b. Summing
   - c. Sending result to other cells
   - d. Giving weights
3. Which of these is a "Complex Problem" solved by AI?
   - a. Opening a file
   - b. Typing
   - c. Changing font
   - d. Self-driving cars

Unit 4

Python



Unit Lessons:

- **Lesson 1** Practical Application of Data Analysis Using Excel File
- **Lesson 2** Conditional Statements in Python
- **Lesson 3** Loops and Functions
- **Lesson 4** Data Structures and Collections
- **Lesson 5** Introduction to Cryptography Using Python
- **Lesson 6** Encryption in Python: How to Turn Python Messages into Secrets Using the XOR Operator?

7 Programs like .... can conduct natural conversations and help with homework.

a. ChatGPT
b. Spotify
c. Windows
d. NumPy

2 Put (✓) or (✗):

1 Artificial Neural Networks are the building blocks of a single neuron. (   )

2 The Threshold function gives a result of 1 if the value is above a specific limit. (   )

3 Bias helps the neuron give results even if there are no inputs. (   )

4 Matplotlib and Seaborn are used for scientific calculations. (   )

5 Data analysis includes inspecting, cleaning, and transforming data. (   )

6 Smart assistants like Siri do not use neural networks. (   )

7 The result of np.mean() is always a decimal (float). (   )

8 In AI, weights determine the importance of each input. (   )

Model Exam 5

1 Choose the correct answer:

1 Why is Python suitable for data analysis?

a. It is difficult.

b. It has powerful libraries like Pandas.

c. It has no support.

d. It works on mobiles only.

2 .... of the neuron acts like a "decision-maker".

a. The weight   b. The input

c. The activation function   d. The list

3 Which library is used to perform mathematical calculations like the mean?

a. NumPy   b. Matplotlib

c. Siri   d. Excel

4 If you want to group sales by month, which step is necessary?

a. Using np.max( )

b. Extracting month from date data

c. Deleting text

d. Changing colors

5 The .... program was an early AI success that could solve logical mathematical problems.

a. Siri   b. ChatGPT

c. Spotify   d. Logic Theorist

6 Teaching a computer to learn from data by itself instead of manual programming is called ....

a. Expert Systems   b. Machine Learning

c. Logic Theory   d. Data Entry

4 Neural networks improve their performance over time by ....

a. deleting neurons
b. learning from experiences
c. turning off
d. none of them

5 In the 1990s, the appearance of .... provided huge amounts of data for AI development.

a. the Internet
b. MYCIN
c. Logic Theorist
d. expert systems

6 Neural networks can predict things like ....

a. future prices or weather
b. your favorite color
c. your name
d. computer weight

7 In the code import pandas as pd, pd is: ....

a. a new language
b. an error
c. a shortcut for Pandas
d. a data type

2 Put (✓) or (✗):

1 Python is compatible with AI and Machine Learning. (   )

2 The activation function is used before multiplying inputs by their weights. (   )

3 Learning from experiences allows a neural network to improve itself. (   )

4 Critical thinking means accepting all AI results without any questions. (   )

5 Artificial Neural Networks are used in language translation. (   )

6 Bias in AI can happen if the training data is incomplete. (   )

7 Numerical data can include decimals like weights and prices. (   )

8 To calculate the mean in Python, the list of numbers must be ordered. (   )

Lesson 1

Practical Application of Data Analysis Using Excel File

» There are several requirements that must be met in the operating environment:

• هناك عدة متطلبات يجب توفرها في بيئة التشغيل:

Required Libraries	Installation code	Function of library
pandas	pip install pandas	• Used for data analysis and reading Excel files. لتحليل البيانات وقراءة ملفات Excel.
matplotlib	pip install matplotlib	• Used for for creating graphs. لإنشاء الرسوم البيانية.

NOTE:

» An Excel file named grades.xlsx must be placed in the same folder with the program.

• يجب وجود ملف إكسل باسم grades.xlsx في نفس مجلد البرنامج.

Name	Math	Science	English
Ali	12	11	15
Khaled	14	14	12
Mohammed	13	15	13
Sabah	11	12	14
Mustafa	10	13	15
Yousef	15	13	12

Loading and displaying data through the following code:

Python - Prep2

```
import pandas as pd
df= pd.read_excel('grades.xlsx')
print(df.head())
```

Explanation:

Code	Function
• import pandas as pd.	• It imports pandas library, which helps us deal with data and tables. • يقوم باستدعاء مكتبة pandas التي تساعدنا في التعامل مع البيانات والجداول.
• df = pd.read_excel ('grades.xlsx').	• It reads data from a file "grades.xlsx" and stores it in a variable called df. • يقوم بقراءة البيانات من ملف grades.xlsx ويخزنها في متغير اسمه df.
• print (df.head()).	• It displays the first 5 rows of the Excel file. • يعرض أول ٥ صفوف في ملف الإكسل.

Basic Data Analysis:

Python - Prep2

```
grades = df[['Math', 'Science', 'English']]
print("Average")
print(grades.mean().to_dict( ))
print("Maximum value")
print(grades.max().to_dict( ))
print("Number of successful students")
print((grades > 13).sum( ).to_dict( ))
```

» Explanation:

Code	Function
• grades = df (('Math', 'Science', 'English')).	• It selects only the Math, Science, and English columns from the table df, and stored in variable grades.
• print ("Average") print(grades.mean(). to_dict ()).	• It displays the word "Average". • It calculates the average (mean) for each subject. • It converts results to dictionary format for easy reading.
• print ("Maximum value") print (grades.max( ).to_dict ( )).	• It displays "Maximum value", the highest grade in each subject.
• print ("Number of successful students") print ((grades > 13) sum( ).to_dict ( )).	• It displays the "Number of successful students". • It displays the number of students who scored above 13 in each subject.

In brief:

» This code performs a statistical analysis of the data in the table and shows you:

- The average grades for each subject.
- The highest grade in each subject.
- How many students passed in each subject.

باختصار: هذا الكود يقوم بعمل تحليل إحصائي للبيانات الموجودة بالجدول، ويعرض لك:

• متوسط درجات كل مادة. • أعلى درجة في كل مادة. • عدد الطلاب الذين نجحوا في كل مادة.

Visualizing Data Graphically:

Python - Prep2

```
1. import matplotlib.pyplot as plt
2. df.mean().plot(kind='bar')
3. plt.show()
4. grades.mean( ).plot(kind='pie')
5. plt.show()
```

Explanation:

Code	Function
• import matplotlib.pyplot as plt	• It imports matplotlib library, which helps us draw graphs. • يقوم باستدعاء المكتبة التي تساعدنا على إنشاء الرسوم البيانية.
• as plt.	• It uses shortcut plt instead of the long name matplotlib. • This makes writing easier and saves time.
• grades.mean( ).plot(kind='pie')	• It takes the average for each subject using grades.mean( ). • Then draws it in a Pie shape using plot (kind='pie'). • يقوم بحساب متوسط كل مادة باستخدام:grades.mean ( ) • ثم يقوم برسم النتائج على شكل (Pie Chart)
• plt.show( ).	• It's always added after each plot to display it. • يتم إضافة هذا الأمر دائمًا بعد كل رسم بياني ليتم عرضه.

- We ask the program to display the drawing.
- A drawing appears showing bars or a pie shape representing the average grade of a subject.
- This makes it easier for us to compare grades quickly in an attractive way.

الاستنتاج:

- نطلب من البرنامج عرض الرسم.
- يظهر رسم بياني على شكل أعمدة أو مخطط دائري يوضح متوسط درجات المواد.
- يساعد ذلك على مقارنة الدرجات بسرعة وبطريقة جذابة.

Interpreting Results:

- To calculate **correlation** between subjects in a data table, use this code:

```
print(df.corr())
```

- It finds the relationship between subjects in the data table.
- It answers questions like: ***Does one subject affect the other?***

  For example, if a student is good at Math, are they often good at Science too?

Explanation:

Code	Function
• grades = df [['Math', 'Science', 'English']].	• It selects only the Math, Science, and English columns from the table df, and stored in variable grades.
• print ("Average") print(grades.mean(). to_dict ()).	• It displays the word "Average". • It calculates the average (mean) for each subject. • It converts results to dictionary format for easy reading.
• print ("Maximum value") print (grades.max( ).to_dict ( )).	• It displays "Maximum value", the highest grade in each subject.
• print ("Number of successful students") print ((grades > 13) sum( ).to_dict ( )).	• It displays the "Number of successful students". • It displays the number of students who scored above 13 in each subject.

In brief:

This code performs a statistical analysis of the data in the table and shows you:

- The average grades for each subject.
- The highest grade in each subject.
- How many students passed in each subject.

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• متوسط درجات كل مادة. • أعلى درجة في كل مادة. • عدد الطلاب الذين نجحوا في كل مادة.

Visualizing Data Graphically:

Python Prep2

```
1. import matplotlib.pyplot as plt
2. df.mean().plot(kind='bar')
3. plt.show()
4. grades.mean( ).plot(kind='pie')
5. plt.show()
```

- The result will be numbers between -1 and 1.
  - If it is close to 1 ⟶ Strong and positive relationship, both subjects increase together.
  - If it is close to 0 ⟶ No clear relationship.
  - If it is close to -1 ⟶ inverse relationship
    If one increases, the other decreases.
- Example: If the correlation between Math and Science = 0.9, this means students who are good at Math usually good at science as well.
- This is useful in understanding how subjects affect each other.

تفسير النتائج: لحساب معامل الارتباط بين المواد داخل جدول البيانات نستخدم هذا الكود لإيجاد العلاقة بين المواد داخل الجدول.

يجيب عن أسئلة مثل: هل تؤثر مادة على مادة أخرى؟

على سبيل المثال: إذا كان الطالب جيدًا في الرياضيات، هل يكون غالبًا جيدًا في العلوم أيضًا؟

النتيجة تكون أرقامًا بين 1- و 1:

- إذا كان الرقم قريبًا من 1 ⟵ علاقة قوية وطردية (أي أن المادتين ترتفعان معًا)
- إذا كان الرقم قريبًا من 0 ⟵ لا توجد علاقة واضحة.
- إذا كان الرقم قريبًا من 1- ⟵ علاقة عكسية (أي إذا زادت درجة مادة تقل الأخرى)

مثال: إذا كان معامل الارتباط بين الرياضيات والعلوم = 0.9 فهذا يعني أن الطلاب **المتفوقين في الرياضيات غالبًا متفوقون في** العلوم أيضًا هذا يفيد في فهم تأثير المواد بعضها على بعض.

أهم الكلمات والمصطلحات

Pandas (pd)	مكتبة لتحليل البيانات	Visualization	التمثيل البياني / البصري
Matplotlib (plt)	مكتبة للرسوم البيانية	Plot	رسم – تخطيط
Library / Package	مكتبة برمجية / حزمة	Dictionary (dict)	قاموس
Import	استدعاء (للمكتبات)	Strong Relationship	علاقة قوية
DataFrame (df)	إطار بيانات (الجدول)	Inverse Relationship	علاقة عكسية
Mean / Average	المتوسط الحسابي	File Path / Folder	مسار الملف / المجلد
Pyplot	اختصار: python plot	Pip install	أمر تثبيت المكتبات

Exercises on Lesson 1

1 Choose the correct answer:

1. What is the primary function of the pandas library?
   - a. Drawing graphs
   - b. Playing audio files
   - c. Analyzing data and reading Excel files
   - d. Creating websites
2. Which library is responsible for creating graphs in Python?
   - a. numpy
   - b. pandas
   - c. tkinter
   - d. matplotlib
3. The library used for reading Excel files and data analysis is ....
   - a. matplotlib
   - b. pandas
   - c. math
   - d. grades
4. To install the matplotlib library, we use the code ....
   - a. pip install excel
   - b. install pandas
   - c. pip install matplotlib
   - d. get matplotlib
5. What command is used to load an Excel file?
   - a. pd.load_file( )
   - b. pd.read_excel( )
   - c. pd.open( )
   - d. df.read( )
6. What does the command df.head( ) do?
   - a. Displays the first 5 rows
   - b. Deletes the first 5 rows
   - c. Displays the last 5 rows
   - d. Displays the number of columns
7. If we want to select only specific columns like Math and English, we use ....
   - a. df.all()
   - b. df[['Math', 'English']]
   - c. df.delete()
   - d. df.head()
8. What is the type of graph resulting from: grades.mean().plot(kind='bar')?
   - a. Pie chart
   - b. Scatter plot
   - c. Line chart
   - d. Bar chart

9 To convert results into a dictionary format for easier reading, we use .....

a. to_list() b. to_excel() c. to_dict() d. to_graph()

10 What does the code grades.mean( ) do?

a. Calculates the highest grade

b. Calculates the lowest grade

c. Calculates the average for each subject

d. Deletes columns

11 To draw a Pie Chart for the average grades, we use ....

a. plot(kind='bar') b. plot(kind='pie')

c. show(pie) d. mean(shape)

12 What is the function of the code: grades.max ( )?

a. Finding the lowest grade b. Finding the highest grade

c. Calculating the sum of grades d. Counting the number of students

13 What is the function of the code: (grades > 13).sum( )?

a. Calculating student grades

b. Comparing students with each other

c. Reordering grades

d. Calculating the number of students above 13

14 What does df.corr( ) mean?

a. Shows the number of rows

b. Removes data

c. Calculates the correlation between subjects

d. Calculates the average

15 The command used to show column graph is ....

a. grades.mean().plot(kind='pie')

b. grades.mean().plot(kind='bar')

c. both a and b

d. none of them

16 Which of the following is used to display the graph? ....

a. plt.show( ) b. plt.start( ) c. plt.run( ) d. plt.open( )

17 Correlation results are always numbers between ....

a. 0 and 100 b. 1 and 10

c. -1 and 1 d. -100 and 100

18 If the correlation between Math and ICT is 0.9, it means students good at Math are usually ....

a. bad at ICT
b. good at ICT too
c. only good at English
d. not successful

2 Put (✓) or (✗):

1 📖 The pandas library is used to read Excel files and analyze data. ( )
2 Matplotlib is used for scientific calculations only ( )
3 📖 The head( ) function displays all data in the table. ( )
4 The shortcut "pd" is used instead of the long name matplotlib.pyplot. ( )
5 📖 The matplotlib library can create bar, pie, and line charts. ( )
6 plot(kind='pie') creates a bar chart ( )
7 📖 The command grades.max( ) calculates the average of students' grades. ( )
8 Graphs make it easier and faster to compare grades in an attractive way. ( )
9 The to_dict() function is used to read Excel files. ( )
10 📖 df.corr( ) helps in knowing the relationship between different subjects. ( )
11 Correlation helps us understand if one subject affects another. ( )
12 📖 plt.show( ) does not display the graph. ( )
13 📖 Using (grades > 13) gives true or false results for each student. ( )
14 📖 The code grades.mean( ) gives the highest grade and not the average. ( )
15 A correlation of 0 means there is a very strong relationship between subjects. ( )
16 📖 The grades.xlsx file must be in the same folder as the Python program to work without problems. ( )
17 📖 pandas can be used to create graphs without the need for the matplotlib library. ( )
18 Positive relationship means both subjects increase together. ( )

Lesson 2

Conditional Statements in Python

- We previously learned about Python, variables, and their types.
- In this lesson, we will learn about Conditional Statements.

python™

• درسنا سابقًا لغة البرمجة بايثون والمتغيرات وأنواعها، وفي هذا الدرس سوف نتعلم مفهوم الجمل الشرطية.

The concept of conditional statements:

- In Python, conditional statements are used to make logical decisions.
- The program runs a specific code only if a certain condition is true.

• في لغة بايثون، تُستخدم الجمل الشرطية لاتخاذ قرارات منطقية. هذه الجمل تُخبر البرنامج أن ينفذ جزءًا معينًا من الكود إذا تحقق شرط معين.

General Syntax

```
if condition:
    # If the condition is True
else:
    # Otherwise, execute this code
```

Types of Conditional Statements:

❶ Simple IF:

- It's used when there is only one possibility (One Choice).

• تُستخدم عند وجود احتمال واحد فقط.

Python - Prep2

```
age = 18
if age >=18:
    print("Allowed to enter")
```

❷ IF... else:

- It's used to choose between two paths (Two Choices)
- If the condition is TRUE, execute the first code;

  if not, execute the other code.

• تُستخدم للاختيار بين مسارين. (إذا تحقق الشرط تنفذ الكود الأول، وإذا لم يتحقق تنفذ الكود البديل)

Python - Prep2

```python
age = 16
if age >=18:
    print("Allowed to enter")
else:
    print("Sorry, you cannot enter")
```

❷ IF...ELIF ...ELSE:

- It's used to check multiple conditions.
- If one of the conditions is TRUE, the program stops and executes its code.
- In other words, the program executes the first TRUE condition

• تُستخدم لاختبار عدة شروط مختلفة؛ إذا تحقق أحد الشروط يتوقف البرنامج عنده وينفذ كوده . **البرنامج ينفذ أول شرط** صحيح.

Python - Prep2

```python
mark = 85
if mark >= 90:
    print("Excellent")
elif mark >= 75:
    print("Very Good")
elif mark >= 60:
    print("Good")
else:
    print("Fail")
```

Practical Example:

Python - Prep2

```
number = int(input("Enter a number: "))

if number > 0:
    print("The number is positive")
elif number < 0:
    print("The number is negative")
else:
    print("The number is zero")

```

NOTE:

- The code number = int(input("Enter a number: ")) is used to get a number from the user.
- = is used to assign a value to a variable (score = 90).
- == is used to compare two values inside an if condition. (if score == 90:)

أهم الكلمات والمصطلحات			
Conditional Statements	الجمل الشرطية	elif	اختصار لـ (else if)
Logical Decisions	قرارات منطقية	else	وإلا (الاحتمال الأخير)
General Syntax	الصيغة العامة / قواعد الكتابة	Indent	إزاحة
Simple IF	الجملة الشرطية البسيطة	Execute	تنفيذ (تشغيل الكود)
Condition	الشرط	Practical Example	مثال تطبيقي

Exercises on Lesson 2

1 Choose the correct answer:

1 In Python, conditional statements are used to make ....
   a. mathematical errors   b. logical decisions
   c. complex variables   d. faster Internet

2 What is the goal of conditional statements in Python?
   a. Repeat code only   b. Define functions
   c. Create variables
   d. Execute specific code when a condition is met

3 What is the correct syntax to write an "if" statement?
   a. if: condition   b. if condition:
   c. condition if   d. if (condition) then

4 Which type of conditional statement is used when there is only one choice?
   a. IF ... ELIF ... ELSE   b. IF ... ELSE
   c. IF statement   d. ELIF only

5 What happens if the condition in an if statement is False?
   a. The "if" code is executed
   b. The program stops completely
   c. It ignores the if statement and moves to the next part
   d. An error appears

6 The .... statement is used to choose between two choices.
   a. IF only   b. IF ... ELSE
   c. IF ... ELIF   d. nested list

7 The "else" statement is used ....
   a. to execute an alternative code when the condition is False.
   b. when the condition is always true
   c. when there is no condition
   d. when we want to define a variable

8 When checking multiple conditions, we should use ....

a. IF ... ELIF ... ELSE
b. IF only
c. Software
d. Routers

9 Which of the following is a correct example of if....else?

a. if x >10
   else:
b. If x >10:
   else x:
c. if x >10: print("OK")
   else: print("NO")
d. if x >10
   else:

10 What does the word "elif" mean?

a. End of program
b. An additional branch between if and else
c. A loop
d. A ready-made function

11 Which statement is used to test multiple sequential conditions?

a. if only
b. else only
c. if...elif...else
d. print

12 A weather app checks if it is "Sunny", "Rainy", or "Snowy". Since there are multiple conditions, which should be used?

a. IF only
b. IF ... ELSE
c. IF ... ELIF ... ELSE
d. read_excel

13 What happens if the first condition in an if...elif...else statement is TRUE?

a. All conditions are executed
b. Only the elif condition is executed
c. A warning appears
d. The remaining conditions are ignored

14 Which of the following is a correct condition in Python?

a. if x = 5
b. if x == 5:
c. if x => 5
d. if x =< 5

15 When writing:

```
age = 18
if age  >=18:
    print("Allowed")
```

what is the result?

a. "Allowed" will be printed
b. Nothing will be printed
c. An error will appear
d. "Not allowed" will be printed

2 Put (✓) or (✗):

1 Conditional statements tell the program to run code based on certain conditions. (   )

2 The if statement is used to make a decision based on a condition. (   )

3 Simple IF is the best choice when you have two different paths. (   )

4 An else statement can be written without an if before it. (   )

5 The symbol "==" is used inside an if condition to compare two values. (   )

6 You can use more than one "elif" in the same conditional block. (   )

7 A number < 0 condition is used to check if a number is negative. (   )

8 A condition in Python must end with a semicolon (;). (   )

9 An if statement can execute more than one line inside it. (   )

10 The word "elif" is an abbreviation for "else if". (   )

11 The program stops checking conditions once it finds a TRUE one in an ELIF chain. (   )

12 The condition inside "if" must only be a mathematical calculation. (   )

13 It is possible for a conditional statement to have if without else. (   )

14 The code inside if must be indented by only one space. (   )

15 If the "if" condition is True, the program ignores the "else" part. (   )

16 if...elif...else helps the program choose only one path for execution. (   )

17 Simple IF is the best choice when you have two different paths. (   )

Test Yourself on Lessons 1&2

1 Choose the correct answer:

1 .... library is mainly used for data analysis and reading Excel files
a. Matplotlib b. Pandas c. Tkinter d. Chrome

2 What is the correct syntax for an "if" statement in Python?
a. if condition: b. if: condition
c. if (condition) then d.condition if

3 .... command display the first 5 rows of a table.
a. df.tail( ) b. df.show( ) c. df.head( ) d. df.open( )

4 In a conditional block, what does "elif" stand for?
a. Elementary if b. Else if c. End if d. Every if

5 .... is used to create and display graphs in Python.
a. numpy b. pandas c. matplotlib d. excel

6 .... Used to calculate the average of a column of grades.
a. .max( ) b. .sum( ) c. .total( ) d. .mean( )

7 If you enter -5 to a program, which condition becomes True?
a. if number > 0: b. if number = 5:
c. if number < 0: d. None of them

2 Put (✓) or (✗):

1 The command pd.read_excel( ) is used to load data from an Excel file. ( )

2 An else statement can be used by itself without an if statement. ( )

3 A correlation (df.corr( )) of 0.95 indicates a very strong relationship between two subjects. ( )

4 The plt.show( ) function is used to hide the graph from the screen. ( )

5 You can use multiple elif statements to check many different conditions. ( )

6 The abbreviation "pd" is commonly used when importing the Pandas library. ( )

7 The symbol "==" is used inside an if condition to compare two values. ( )

8 Every if statement must have an else part to work correctly. ( )

Lesson 3

Loops and Functions

1 Loops

Loops help you repeat a specific task many times without rewriting the same code.

• تساعدك الحلقات التكرارية على تنفيذ أمر معين عدة مرات دون الحاجة لكتابته يدويًا في كل مرة.

1 The for Loop:

It's used when you know exactly how many times you want to repeat the code.

• تستخدم عندما يكون عدد مرات التكرار معروفًا مسبقًا.

General Syntax

```
for item in sequence:
print(item)
```

Example:

Python - Prep2

```
for i in range(5):
    print("Hello!")   # Prints "Hello" 5 times
```

NOTE:

- range(5) means from 0 to 4 (5 iterations).
- Everything under the 'for' loop is executed in every iteration.

ملحوظة: range (5) تعني البدء من 0 وصولًا إلى 4 (أي 5 دورات). كل أمر تحت for ينفذ في كل دورة.

2 The While Loop:

- It's used when you want to repeat the code as long as a condition is True.
- There must be something that changes the condition, otherwise it will run forever.

- تستخدم للتكرار ما دام شرط معين متحققًا.
- يجب أن يكون هناك شيء يغير الشرط، وإلا فإنها ستستمر إلى الأبد.

Example:

Python - Prep2

```python
x = 0
while x < 3:
    print("I am learning!")
    x += 1
```

Explanation:

• X = 0	• Initial value of X.
• while x < 3:	• Start a loop • It will run as long as condition is TRUE (x < 3).
• print ("I am learning!")	• It displays "I am learning!" on the screen.
• x + = 1	• It increases the value of x after each iteration.

Warning:

- Ensure the condition **eventually** becomes false to avoid an infinite loop.
- If you forget to increment x, it will run forever!"

- تحذير: تأكد أن الشرط سيصبح في النهاية false لتجنب **الحلقة اللانهائية**.
- إذا نسيت زيادة قيمة x ، فستستمر الحلقة في العمل **إلى الأبد**.

Example 1: Printing numbers from 1 to 5:

```
for num in range(1, 6):
    print(num)
```

- range(1, 6): means from 1 to 5 (6 is not included).

Example 2: Summing list numbers:

```
numbers = [10, 20, 30]
sum = 0
for n in numbers:
    sum += n
print("Total =", sum)
```

Explanation:

• numbers = [10, 20, 30]	• It creates a list called numbers with values 10,20,30.
• sum = 0	• It creates a variable called sum and sets it to 0 (initial value).
• for n in numbers:	• It starts a loop that goes through the list. • Each time storing one number in variable n.
• sum + = n	• It adds the current value of n to the variable sum in each iteration. • It is the same as: sum = sum + n
• print "Total =", sum	• It displays the final result after the loop finishes.

NOTES:

- n takes the value of each element in the list in order.
- Use for when you know the number of iterations.
- Use while when the iteration depends on a condition.

تذكر:

- n يأخذ قيمة كل عنصر في القائمة بالترتيب.
- استخدم for عندما تعرف عدد المرات.
- استخدم while عندما يعتمد التكرار على شرط.

2 Functions

- A function is used to perform a specific task.
- Instead of writing the same code repeatedly, we write it once in a function and call it whenever we want!

- تستخدم الدالة لتنفيذ مهمة محددة بدلًا من كتابة نفس الكود مرارًا، نكتبه مرة واحدة في دالة ونستدعيها متى شئنا!

What is function?

- Task: To perform a specific task such as:
  1. calculating the sum of two numbers.
  2. printing a message, etc.
- Benefit: It makes the code more organized and easier to understand and modify.

- مهمتها تنفيذ مهمة معينة، مثل:
  1. حساب مجموع عددين.
  2. طباعة رسالة.
- فائدتها: تجعل الكود أكثر تنظيمًا وأسهل في الفهم والتعديل.

How to create a function?

» We use def to create a function.

Python - Prep2

```python
def greet():
    print("Welcome! I am a new function")
```

» Explanation:

def	• It's used to create a function (short of "define").
greet ( ):	• Function name: Always placed after the function name. It's always followed by " : "
Indent:	• It's required for the code inside the function.

NOTE:

» The function does not work until we call it!

• ملاحظة: الدالة لا تعمل حتى نستدعيها.

How to call a function?

Python - Prep2

```python
greet()
```

» We call the function by writing its name.

The result: *Welcome! I am a new function.*

Functions with a Parameters (Input):

Python - Prep2

```python
def add(a, b):
    result = a + b
    print(f" The sum is: {result}")

add(3, 5)
```

» **Result:** 8

» **Explanation:**

• def add [a, b]:	• It defines a function named add. • It takes two parameters a and b.
• result = a + b	• It adds a and b together. It stores the result in variable result.
• print (f "The sum is: {result}")	• It displays the value of variable result using f-string.

Functions that returns a result (Return):

Python - Prep2

```python
def multiply(x, y):
    return x * y

product = multiply(4, 6)
print("The Product is: ", product)
```

» **Result:** 24

NOTES:

1. The difference between print and return:
   print: Displays the result on the screen only.
   return: Returns the result to be used later in the code.
2. Functions make your programs faster and easier to modify.
3. The more you practice, the more skilled of you will become!

1. print يعرض النتيجة على الشاشة فقط. return يُرجع النتيجة لاستخدامها لاحقًا في الكود.
2. الدوال تجعل برامجك أسرع و أسهل في التعديل.
3. كلما تدربْتَ أكثر أصبحت مبرمجًا ماهرًا!

أهم الكلمات والمصطلحات			
Loops	الحلقات التكرارية	Return	إرجاع النتيجة (لحفظها)
For Loop	حلقة التكرار المحدود	Indentation	المسافة البادئة (الفراغ الإجباري)
While Loop	حلقة التكرار المشروط	Infinite Loop	حلقة لانهائية
Def	اختصار: Define (تعريف دالة)	Iteration	دورة تكرارية واحدة
Call	استدعاء الدالة	Syntax	الصيغة العامة لكتابة الكود
Parameter	المعاملات (مدخلات الدالة)	Increment	زيادة (رفع قيمة العداد)

Exercises on Lesson 3

1 Choose the correct answer:

1 A "for" loop is used when............................ .
  a. the repetition depends on a specific condition.
  b. the number of iterations is unknown.
  c. we want to run the code only once.
  d. the number of iterations is known.

2 In programming, a "Function" means ....
  a. repeating the code.
  b. a tool designed to perform a specific task.
  c. storing data.
  d. creating new variables.

3 .... are the inputs passed into a function
  a. Parameters b. Outputs c. Names d. Results

4 The code inside a function must be ....
  a. written without any indentation.
  b. written after a semicolon (;).
  c. written with an indentation .
  d. placed inside parentheses.

5 The keyword "def" is used to ....
  a. define a function. b. create a variable.
  c. create a loop. d. print text.

6 .... function used to generates a sequence of numbers
  a. List( ) b. Number( ) c. Range( ) d. Sequence( )

7 A "while" loop continues to execute as long as ....
  a. the number of iterations is known.
  b. the condition is true.
  c. the number of iterations = 0
  d. the condition is false.

8 Which command sends a result back to the caller?

a. Print b. Return c. Send d. Give

9 📖 If we do not change the condition inside a "while" loop, ...

a. it will stop immediately. b. a system error will occur.

c. an infinite loop will occur. d. it will run only once.

10 .... is the mandatory space inside a function

a. Blank b. Gap c. Indentation d. Margin

11 📖 The correct way to "call" a function is by ....

a. writing "def" only.

b. writing variables inside a print statement.

c. writing the file name.

d. writing the function name followed by ( ).

12 .... symbol follows a function name in "def"

a. Semicolon (;) b. Colon (:) c. Hash (#) d. Arrow (->)

13 📖 Parameters in a function are ....

a. the values that the function returns.

b. the values we pass to the function to work on.

c. the commands inside the function.

d. the name of the function.

14 In range(5), what is the last number produced?

a. Five b. Zero c. Six d. Four

15 📖 The difference between "return" and "print" is that "return ....

a. stores the result for later use.

b. displays the result on the screen.

c. repeats the code.

d. creates a new function.

16 📖 The primary purpose of functions is to ....

a. increase the length of the code.

b. write the same code multiple times.

c. make the program more organized.

d. eliminate the need for variables.

2 Put (✓) or (✗):

1 📖 A for loop is suitable when you know the number of iterations in advance. ( )

2 📖 A while loop can work without a condition. ( )

3 A function must always have at least one parameter. ( )

4 📖 Forgetting to change the condition inside a while loop may cause an infinite loop. ( )

5 The range(1, 5) function includes the number 5. ( )

6 📖 A function does not work unless it is called. ( )

7 A while loop checks the condition before every iteration. ( )

8 📖 A function cannot contain parameters. ( )

9 A function can be created using the keyword "func". ( )

10 📖 The code inside a function must be indented (Indentation). ( )

11 📖 The return statement is used only to display the result on the screen. ( )

12 📖 Functions help organize code and reduce repetition. ( )

13 You can call the same function multiple times in one program. ( )

14 📖 A for loop always depends on a logical condition only. ( )

15 📖 A function can be called more than once within the same program. ( )

16 Comments starting with # are ignored by the computer. ( )

3 Complete the following sentences:

1 The .... loop is used when we know the number of iterations in advance.

2 To define a new function in Python, we use the keyword ....

3 A .... loop continues to run as long as the condition is True.

4 The empty space at the beginning of the code inside a function is called ....

5 To get a result back from a function and store it, we use the .... statement.

Lesson 4

Data Structures and Collections

What are Data Structures?

» Data structures are organized ways to store data in a program.

Example:

① Shopping List (List):
- It's used to write items we want to buy

② School Timetable (Tuple):
- It is fixed does not change during the week.

③ Dictionary:
- It stores data as pairs of "Keys" and "Values."

• هياكل البيانات هي طرق منظّمة لتخزين البيانات داخل البرنامج.

أمثلة: ① قائمة المشتريات (List): تُستخدم لكتابة الأشياء التي نريد شراءها.

② جدول الحصص المدرسية (Tuple): جدول ثابت لا يتغير خلال الأسبوع.

③ القاموس (Dictionary): يخزن البيانات على شكل أزواج من مفاتيح (Keys) و قيم (Values).

① List:

» A List of items that can be modified.

» Items can be added or deleted.

» It uses square brackets [ ].

① القائمة:

• هي قائمة من العناصر يمكن تعديلها، حيث يمكن إضافة عناصر أو حذفها. وتُكتب باستخدام الأقواس المربعة [ ].

Example:

» Imagine we have students' math scores and want to calculate the average.

Python - Prep2

```
grades = [85, 90, 78, 92, 88] # List of grades
average = sum(grades) / len(grades)
print("The average is: ", average)
```

Explanation:

- Sum(grades): It calculates the total sum of all numbers in the list.
- تَحسب مجموع جميع الأرقام الموجودة داخل القائمة.
- Len(grades): It counts the number of items are in the list (length).
- تحسب عدد العناصر الموجودة داخل القائمة.

Main Operations:

Operation	Code	Explanation
Add	• grades. append(95).	• It adds a new grade. إضافة درجة جديدة
Delete	• grades. remove(78)	• It deletes a specific grade. حذف درجة محددة
Sort	• grades.sort( ).	• It sorts items in order. ترتيب الدرجات تصاعديًا

2 Tuple:

- It is similar to a list but cannot be modified.
- It is used to store fixed data such as:
  - Days of the week.
  - Location coordinates.
- Tuples are written using parentheses ( ).

2 القائمة الثابتة

- تشبه القائمة ولكن لا يمكن تعديلها.
- تُستخدم لتخزين بيانات ثابتة، مثل: أيام الأسبوع، وإحداثيات الموقع الجغرافي.
- تُكتب باستخدام الأقواس العادية ( ).

Example:

- Days of the week are fixed and cannot be changed.

Python - Prep2

```
days = ("Saturday", "Sunday", "Monday",
"Tuesday", "Wednesday", "Thursday", "Friday")

print("The third day is:", days[2])
```

» **Output:** *The third day is: Monday.*

» **Explanation:**

- Index numbering starts from 0.
- The third item is stored at index 2.

③ Dictionaries:

① A Dictionary is a collection of items stored as a pair: Key → Value.

② It is written inside curly brackets { }.

③ It uses a colon to separate keys and values.

④ It is used for fast access to data by using "Key" instead of an index in lists.

⑤ Keys must be unique. It can be strings or numbers.

⑥ You can easily add new items or update existing values.

⑦ It is widely used to store organized data like student or employee records.

③ القواميس:

① القاموس عبارة عن مجموعة عناصر تُخزن في شكل: مفتاح ← قيمة.

② يُكتب القاموس داخل الأقواس المعقوفة { }.

③ يتم استخدام النقطتين (:) للفصل بين المفتاح والقيمة.

④ يُستخدم للوصول السريع للبيانات باستخدام المفتاح بدلًا من الفهرس.

⑤ يجب أن تكون المفاتيح غير مكررة، ويمكن أن تكون نصوصًا أو أرقامًا.

⑥ يمكن بسهولة إضافة عناصر جديدة أو تعديل القيم الموجودة.

⑦ يُستخدم كثيرًا لتخزين البيانات المنظمة، مثل بيانات الطلاب أو الموظفين.

Exercise 1

Python - Prep2

```
for i in range(5):
    print("Hello!")      # Prints "Hello" 5 times

student = {'name': 'Ali', 'age': 15, 'grade': 'A'}

print(student["name"])

student['age'] = 16
student['city'] = 'Cairo'

print(student)
```

Explanation:

• student = {'name': 'Ali', 'age': 15, 'grade': 'A'}.	• It creates a dictionary with 3 key-value pairs.
• print(student["name"]).	• It prints the value of key 'name'.
• student['age'] = 16	• It updates the value of 'age' from 15 to 16.
• student['city'] = 'Cairo'.	• It adds a new key-value pair 'city': 'Cairo'.
• print(student).	• It prints the entire dictionary after modifications.

Practical Exercises: Looping Through the List

Exercise 1

- You have a list of student ages.
- Write a program to count how many students are older than 15.

Python - Prep2

```
ages = [14, 16, 15, 17, 14, 16]
count = 0
for age in ages:
    if age > 15:
        count += 1
print(Number of students older than 15 is:",
count)
```

Explanation:

• ages = [14, 16, 15, 17, 14, 16]	• It creates a list stores students' ages.
• count = 0	• It creates a counter (variable) starting at 0
• for age in ages:	• A loop that checks each age in the list one by one is created.
• if age > 15:	• It checks if each age is greater than 15.
• count += 1	• It increases count by 1 if the condition is true.

Exercise 2

- Looping through a list of names
- Print each name from the list.

Python - Prep2

```
names = ["Mohamed", "Mona", "Haba", "Asmaa"]
for name in names:
    print(name)
```

Explanation:

• names = ["Mohamed", "Mona", "Haba", "Asmaa"]	• Creates a list stores students' names.
• for name in names:	• It goes through each name inside the list one by one. • The current name is stored in the variable name.
• print(name)	• It prints the current name. • The loop repeats until all names in the list are printed.

أهم الكلمات والمصطلحات

Data Structures	هياكل البيانات	Mutable	قابل للتعديل
Collections	المجموعات	Append	إضافة في آخر القائمة
List	قائمة	Sort	فرز / ترتيب
Tuple	قائمة ثابتة	Unique	فريد (لا يتكرر)
Dictionary	قاموس	Coordinates	إحداثيات

Exercises on Lesson 4

1 Choose the correct answer:

1. What is meant by Data Structures? ....
   a. Ways to beautify the program's look
   b. Ways to execute loops only
   c. organized Ways to store data in a program
   d. Commands to print text

2. In Python data structures, index numbering always starts from ....
   a. 1   b. 10   c. 0   d. -1

3. A .... is a collection of items that can be modified, added, or deleted.
   a. List   b. Tuple   c. Constant   d. Integer

4. Lists are characterized by being: ....
   a. Fixed and unchangeable
   b. Written with parentheses ( )
   c. Unable to store more than one type of data
   d. Capable of adding and deleting items

5. The function .... calculates the total sum of all numbers.
   a. len()   b. sum()   c. sort()   d. total()

6. Which of the following uses square brackets [ ]? ....
   a. List   b. Tuple   c. Set   d. Dictionary

7. To find the number of items in a list, we use the .... function.
   a. count()   b. sum()   c. len()   d. add()

8. The . append( ) function is used to: ....
   a. Delete an item from the list   b. Add a new item to the list
   c. Sort the items   d. Change the type of the list

9. In a dictionary, we use a .... to separate keys from their values.
   a. comma,   b. colon: c. dash -   d. dot

10 A Tuple is characterized by being: ....

a. Modifiable
b. Changes its elements automatically
c. Unmodifiable (Fixed)
d. Written with curly braces { }

11 Tuples are written using .... brackets.

a. square [ ]
b. parentheses ( )
c. curly { }
d. colons :

12 We use a Tuple when we want data that is: ....

a. Constantly changing
b. Fixed and does not change
c. Automatically deleted
d. Based on keys and values

13 A .... goes through each item in a list one by one.

a. for loop
b. Tuple
c. Key
d. Variable

14 A Dictionary stores data in the form of: ....

a. A list inside a list
b. Values only without keys
c. Unordered elements
d. Key : Value

15 To access data quickly in a dictionary, we use a .... instead of an index.

a. number
b. Key
c. bracket
d. loop

16 Which of the following is used to write a Dictionary? ....

a. [ ]
b. ( )
c. { }
d. < >

17 To arrange items in a list in order, we use the .... function.

a. append( )
b. remove()
c. sort()
d. sum()

18 One characteristic of Dictionary Keys is that they: ....

a. Can be repeated
b. Must be unique
c. Cannot be strings
d. Must be numbers only

19 tA Dictionary is useful for storing: ....

a. Organized data like student records
b. Fixed data only
c. Unique numbers only
d. Unordered elements

2 Put (✓) or (✗):

1 Data structures are organized ways to store data. ( )

2 📖 Lists in Python allow you to modify their elements. ( )

3 The grades.remove(78) code is used to delete a specific grade from a list. ( )

4 📖 A Tuple's elements can be changed after they are defined. ( )

5 Location coordinates are best stored in a Tuple because they are fixed data. ( )

6 📖 A Dictionary relies on using keys to access values. ( )

7 If a list has 3 items, the third item is stored at index 3. ( )

8 📖 Keys in a Dictionary that can be repeated without any problem. ( )

9 In a Dictionary, keys must be unique and can be strings or numbers. ( )

10 📖 A List is written using square brackets [ ]. ( )

11 The for name in names: loop repeats until all names in the list are printed. ( )

12 📖 A Tuple uses curly braces { }. ( )

13 The count += 1 code decreases the counter by 1. ( )

14 📖 A Dictionary is suitable for storing student data because it is organized and clear. ( )

15 Dictionaries use square brackets [ ] to store data. ( )

16 📖 A list cannot contain more than one type of data. ( )

17 A Dictionary allows for fast access to data by using a Key. ( )

18 📖 A Tuple is suitable for storing fixed data like days of the week. ( )

19 A school timetable is a good example of a Tuple because it is fixed. ( )

20 📖 Dictionaries do not allow adding new elements after they are created. ( )

Test Yourself on Lessons 3&4

1 Choose the correct answer:

1 .... keyword is used to define a new function in Python
   a. function   b. define   c. def   d. call
2 A "while" loop continues to execute as long as: ....
   a. The number of iterations is known   b. The condition is True
   c. The condition is False   d. The loop is called
3 Lists in Python are written using .... brackets.
   a. square [ ]   b. curly { }   c. parentheses ( )   d. angle < >
4 .... are the inputs passed into a function
   a. Parameters   b. Outputs   c. Names   d. Results
5 A .... stores data as pairs of "Keys" and "Values."
   a. List   b. Tuple   c. Dictionary   d. String
6 Which command is used to add a new item to the end of a List? ....
   a. .add( )   b. .append( )   c. .insert( )   d. .plus( )
7 In Python, index numbering always starts from ....
   a. 1   b. -1   c. 0   d. 10

2 Put (✓) or (✗):

1 You can't add new items to a List. ( )
2 A "for" loop is best used when you know the number of iterations in advance. ( )
3 Elements inside a Tuple can be modified or changed after they are created. ( )
4 In Python, code inside a function or a loop must be indented . ( )
5 Dictionary keys must be unique and cannot be repeated. ( )
6 An infinite loop occurs if the condition in a "while" loop never becomes False. ( )
7 Tuples are written using parentheses ( ) and are suitable for fixed data. ( )
8 The return statement is used to display a result on the screen. ( )

Lesson 5

Introduction to Cryptography Using Python

Cryptography:

- It is the art of converting information from its original readable form called Plaintext into an unreadable form called Ciphertext.
- This way, no one can read or unlock the message except the person who owns the secret key.
- It is like a secret box that has a lock and key.

- التشفير: هو فن تحويل المعلومات من شكلها الأصلي المفهوم الذي يُسمى النص الصريح (Plaintext) إلى شكل غير مفهوم يُسمى النص المُشفَّر (Ciphertext).
- وبهذه الطريقة، لا يستطيع أي شخص قراءة الرسالة أو فك تشفيرها إلا الشخص الذي يمتلك المفتاح السري.
- وهو يشبه صندوقًا سريًا يحتوي على قُفْل ومِفتاح.

1 Right and Wrong Uses of Encryption

Usage Type	Examples	Explanation
Correct Use (Security)	• Protecting messages (WhatsApp) • Securing passwords • Securing websites (https://)	• It helps protect your messages and data from unauthorized access. • تساعد في حماية رسائلك وبياناتك من الوصول غير المصرح به للبيانات.
Wrong Use (Harmful)	• Ransomware viruses. • فيروسات الفِدْية.	• It aims to harm you by encrypting your files and demanding money to unlock them. • يهدف إلى إيذائك عن طريق تشفير ملفاتك وطلب المال لفكها.

2 Encryption Methods طرق التشفير

Types	Explanation	Example مثال
1 Simple Encryption	• It uses fixed and easy rules, such as shifting each letter by a specific number. • قواعد ثابتة وسهلة، مثل إزاحة كل حرف بعدد محدد. (هذا ما سنتعلمه)	• Caesar Cipher. • شفرة قيصر.
2 Complex Encryption	• It uses complex mathematical equations. • It uses very long keys. • It's used by banks and companies. • معادلات رياضية معقدة ومفاتيح طويلة جدًا. (تستخدمه البنوك والشركات)	• AES Algorithm. • خوارزمية AES.

Our Magic Tools in Python:

- Computers understand numbers, not letters.
- Therefore, we use functions like ord() and chr() to convert between letters and numbers.

Function	Functionality	Example مثال
ord( )	• It converts a character into its a corresponding Unicode number. • تحويل الحرف إلى رقمه السري المناظر في نظام 'UNICODE'.	ord('A')→ 65
chr( )	• It converts the secret number into its corresponding character. • تحويل الرقم السري إلى الحرف المناظر له.	chr(65)→ 'A'

Examples Using ord( ) and chr( )

1 To find the code of the letter 'S':

Code	Output
print(ord('S'))	83

❷ To find the character corresponding to the code 72:

Code	Output
print(chr(72))	H

❸ Shift Experiment (Letter D +1)

• تجربة الإزاحة على حرف (+1) 'D'

Python - Prep2

```
code_D = ord('D')
shifted_code = code_D + 1
print(chr(shifted_code))
```

Explanation:

• code_D = ord('D')	• It converts letter D into its Unicode number and stores it in the variable code_D.
• shifted_code = code_D + 1	• It adds 1 to the Unicode number to get the number of the next letter.
• print(chr (shifted_code))	• It converts the new number back into a letter.
• The final result is the letter E.	

Note: The letters used in the code are capital letters.

Applying Encryption and Decryption in Python:

We will now use the shift method (Caesar Cipher) which relies on:

❶ **Encryption:** Original character code + Encryption Key = Encrypted Code.

❷ **Decryption:** Encrypted code − Encryption Key = Original Character Code.

Summary of Key Points:

Point	Summary
Encryption Concept مفهوم التشفير	• It converts Plaintext into Ciphertext using a Key. تحويل النص العادي إلى نص مُشفر باستخدام مفتاح.
ord ( ) function	• It converts a character into its corresponding Unicode number. • تحويل الحرف إلى الرقم المناظر له في جدول (يونيكود).
chr( ) function	• It converts the number into its corresponding character. • تحويل الرقم بين القوسين إلي الحرف المناظر له.
Shift Encryption التشفير بالإزاحة	• It adds a fixed number "Encryption Key" to the original character's number. • يضيف رقمًا ثابتًا "مفتاح التشفير" إلى الرقم المناظر للحرف الأصلي.
Decryption فك التشفير	• It subtracts the same key previously added to get the original character. • يطرح الرقم الثابت السابق إضافته من الرقم المناظر للحرف الجديد للحصول على الرقم المناظر للحرف الأصلي قبل التشفير.

أهم الكلمات والمصطلحات

Cryptography	علم / فن التشفير	Simple Encryption	التشفير البسيط
Encryption	عملية التشفير	Complex Encryption	التشفير المعقد
Decryption	فك التشفير	Ransomware	فيروسات الفِدْية
Plaintext	النص العادي (الأصلي)	UNICODE	نظام ترميز الحروف العالمي
Ciphertext	النص المشفر	Ord( ) Function	دالة تحويل الحرف لرقم
Shift	إزاحة	Chr( ) Function	دالة تحويل الرقم لحرف
Caesar Cipher	شفرة قيصر	AES Algorithm	خوارزمية التشفير المتقدمة

Exercises on Lesson 5

1 Choose the correct answer:

1. What is meant by Plaintext?
   - a. The encrypted text
   - b. Unreadable text
   - c. The original clear text
   - d. Text protected by a key
2. Ciphertext is: ....
   - a. The original text
   - b. Text readable for all
   - c. Text without a key
   - d. encrypted text
3. Which of the following is considered a correct use of encryption?
   - a. Protecting messages and passwords
   - b. Spreading viruses
   - c. Demanding ransom
   - d. Deleting data
4. To create Ciphertext using the shift method, you must add an .... to the original character code.
   - a. Encryption Key
   - b. AES Algorithm
   - c. ord() function
   - d. Plaintext
5. Which of the following is considered a wrong use of encryption?
   - a. Securing accounts
   - b. Encrypting data for protection
   - c. Securing websites
   - d. Ransomware
6. A secure website address usually starts with .... to show it uses encryption.
   - a. http://
   - b. https://
   - c. www.
   - d. ord://

7 Simple encryption relies on ....

a. complex equations
b. very long keys
c. fixed rules like shifting
d. artificial intelligence

8 Decryption is the process of converting .... back into Plaintext.

a. Ciphertext
b. UNICODE
c. the key
d. complex equations

9 Which of the following types is used in banks and companies to ensure maximum security?

a. Simple Encryption
b. Complex Encryption
c. Manual Encryption
d. Shift Encryption

10 The AES Algorithm is an example of .... encryption used by banks.

a. simple
b. caesar
c. complex
d. manual

11 The ord( ) function is used to ....

a. convert text into a sentence
b. convert a number into a character
c. decrypt only
d. convert a character into its Unicode number

12 In Python, ord('A') and ord('a') are ....

a. the same
b. different numbers
c. not numbers
d. errors

13 The formula for Decryption is: ....

a. Plaintext + Key
b. Ciphertext - Key
c. Key + Key
d. Ciphertext + Key

14 The function of chr( ) is ....

a. deleting characters
b. converting a character into a number
c. converting a number into a character
d. encrypting texts

15 The coding system used by Python to assign numbers to characters is called ....

a. caesar
b. AES
c. UNICODE
d. encryption key

16 📖 Shift encryption relies on ....

a. adding a fixed value to the character's number
b. swapping words
c. subtracting a random number
d. changing the order of sentences

17 If you want to convert the secret number 65 back into the letter 'A', you use ....

a. ord(65)
b. chr(65)
c. print('A')
d. shift(65)

18 📖 Decryption by shifting is done through ....

a. adding the encryption key
b. subtracting the key from the encrypted character's number
c. deleting the first character
d. swapping letters automatically

2 Put (✓) or (✗):

1 Computers understand letters directly without needing numbers. ( )
2 Cryptography is the art of hiding information. ( )
3 📖 Encryption is a way to protect information from unauthorized access. ( )
4 Ciphertext is the understandable form of information. ( )
5 📖 Anyone can read encrypted text easily without the encryption key. ( )
6 To encrypt a character, you add a fixed numerical value called the Encryption Key. ( )

7 📖 Wrong use of encryption includes encrypting files and demanding money to unlock them. ( )

8 If we encrypt a message by adding 3, we decrypt it by adding 3. ( )

9 📖 Simple encryption like Caesar Cipher is still used to protect major banks. ( )

10 To shift 'A' to 'B', we use ord('A') + 1. ( )

11 📖 The ord( ) function converts a character into a number. ( )

12 📖 The chr( ) function converts a number into its corresponding character. ( )

13 Protecting WhatsApp messages is a correct use of encryption. ( )

14 📖 Complex encryption relies on long keys and mathematical equations. ( )

15 HTTPS indicates the website is secure and encrypted. ( )

16 📖 In shift encryption, a fixed value is subtracted to produce the ciphertext. ( )

17 📖 Decryption by shifting is done using the subtraction process. ( )

18 📖 Encryption is not used in daily applications like WhatsApp or banks. ( )

Lesson 6

Encryption in Python

» In the previous lesson, you learned a simple encryption method by adding a fixed number to each letter.

- This method is a good starting point.
- However, it is easy to break and not secure enough.

» In this lesson, we will learn a stronger and smarter encryption method using Bitwise Operations (The XOR Operator).

- في الدرس السابق تعلمت طريقة بسيطة للتشفير تعتمد على إضافة رقم ثابت لكل حرف. هذه الطريقة تعتبر بداية جيدة، لكنها سهلة الكسر وليست آمنة بدرجة كافية.
- في هذا الدرس سنتعلم طريقة أقوى وأكثر ذكاءً تعتمد على العمليات على مستوى البِت (Bitwise Operations)، ومعامل XOR.

1 Basics of Encryption: Bitwise Operations:

» Your computer is like a box filled with light bulbs.

» Each bulb has one of two cases:

1. ON (represented by 1)
2. OFF (represented by 0).

» This is a Bit.

Bit: It's the smallest unit of data stored in a computer.

» Computers communicate using binary language: 0s and 1s.

- جهاز الكمبيوتر الخاص بك مثل صندوق كبير من اللمبات، كل لمبة إما مضاءة (وتمثلها القيمة 1) أو مطفأة (وتمثلها القيمة 0).

هذا هو البت (Bit)، أصغر وحدة تخزين للمعلومات في الكمبيوتر.

- أجهزة الكمبيوتر تتواصل باستخدام اللغة الثنائية (0 و1).

Bitwise Operations:

» They are mathematical and logical operations performed directly on binary numbers (0 and 1).

Uses and functions:

1. Processing Speed: It's the fastest way to perform many mathematical and logical operations.
2. Encryption: It's used to build encryption algorithms

2 The Secret Star: The XOR Operation

- XOR means Exclusive OR.
- In Python, it is written using the symbol: ^

The XOR Rule:

Input 1	Input 2	Result
0	0	0
1	1	0
0	1	1
1	0	1

- The result is 1 when the inputs are different.
- The result is 0 when the inputs are the same.

Using XOR in Encryption:

- XOR is perfect for encryption because it is reversible.
- Message + XOR Key ⟶ Encrypted Message (Ciphertext).

ENCRYPTION PROCESS

- Encrypted Message + the same XOR Key ⟶ Original Message

DECRYPTION PROCESS

3 Encryption and Decryption in Python

» In Python, we can convert each character into a number (Bitwise) so we can apply the XOR operator to it.

Helper Tools

1. ord(character):
   - It converts a character into its corresponding Unicode number.
2. chr(number):
   - It converts a number back into its corresponding character in the "Unicode" table.
3. Fixed Secret Key:
   - A number used in both encryption and decryption.
   - We will use secret_key = 10 in all our exercises.

1. حرف ord: يحول الحرف إلى الرقم المناظر لهذا الحرف في جدول "يونيكود".
2. رقم chr: يحول الرقم إلى الحرف المقابل له في جدول "يونيكود".
3. المفتاح السري الثابت: سنستخدم المفتاح secret_key = 10 في جميع الأمثلة.

First: The Encryption Process

Example 1: Encrypting Character "A"

Python - Prep2

```
secret_key = 10
original_char = "A"
encrypted_char_num = ord(original_char) ^ secret_key
cipher_text = chr(encrypted_char_num)
print(f"Cipher: {cipher_text}")
```

Explanation:

• secret_key = 10	• It stores encryption key with value 10 .
• original_char = "A".	• It stores the original character "A".
• encrypted_char_num = ord(original_char) ^ secret_key.	• It prints (f"Decrypted: {decrypted_char}").
• cipher_text = chr (encrypted_char-num).	• It converts encrypted number back to a character.
• print (f"Cipher: {cipher_text}").	• It displays the encrypted character.

Second: Decryption Process.

Example 2: Decryption of previous code.

Python - Prep2

```
secret_key = 10
cipher_text = "K"
encrypted_char_num = ord(cipher_text)
original_char_num = encrypted_char_num ^ secret_key
decrypted_char = chr(original_char_num)
print(f"Decrypted: {decrypted_char}")
```

Explanation:

• secret_key = 10	• The same key used before.
• cipher_text = "K"	• The ciphertext (result from encryption).
• encrypted_char_num = ord(cipher_text)	• It converts cipher character to number.
• original_char_num = encrypted_char_num ^ secret_key.	• It applies XOR decryption with key 10 to get original number.
• decrypted_char = chr(original_char_num).	• It converts decrypted number to character.
• print(f"Decrypted: {decrypted_char}")	• It displays the decrypted character.

PONY - ICT Prep. 2 - Second Term 120

Remember these concepts:

In Your Phone	In Games
Bit	• It's the smallest storage unit, either 1 (ON) or 0 (OFF). • يشير إلى أصغر وحدة تخزين، إما 1 (مضاء) أو 0 (مطفأ).
Bitwise Operations	• They are fast mathematical movements performed on 0s and 1s. • هي حركات رياضية سريعة تُجرى على الأصفار والآحاد مباشرة.
XOR (^)	• The encryption operator. ① It produces 1 if values are different. ② It produces 0 if values are the same. • معامل التشفير ينتج 1 إذا كانت المدخلات مختلفة، و 0 إذا كانت متشابهة.
Secret Key	• It's a number that must be the same for both encryption and decryption. • هو رقم يجب استخدامه بذاته أو نفس الرقم في عمليتي التشفير وفك التشفير.
Reversible Property	• Applying XOR twice with the same key returns the original value. • تطبيق XOR مرتين: مرة عند التشفير ومرة عند فك التشفير بنفس قيمة المفتاح السري لإعادة الرسالة الأصلية.

أهم الكلمات والمصطلحات

Bit	بت (أصغر وحدة تخزين)	Secret Key	المفتاح السري
Bitwise Operations	العمليات على مستوى البت	Reversible Property	الخاصية العكسية
Encryption	التشفير	Ciphertext	نص الشفرة (المشفر)
Decryption	فك التشفير	Original Message	الرسالة الأصلية
ord(character)	دالة تحويل الحرف إلى رقم	Cryptography	علم التشفير
chr(number)	دالة تحويل الرقم إلى حرف		

Exercises on Lesson 6

1 Choose the correct answer:

1 Computer only understand ....

a. English words
b. Python code
c. Binary numbers(bits)
d. Complex decimals

2 📖 A Bit is.............................. .

a. The largest unit of data
b. A complex electrical circuit
c. The smallest storage unit representing 0 or 1
d. A decimal number

3 A bit being "1" means the bulb is: ....

a. Broken
b. ON
c. OFF
d. Dimmed

4 📖 Bitwise operations are used because they are: ....

a. Very slow
b. Too complex for a computer to execute
c. Unrelated to encryption
d. The fastest way to process data

5 To convert a recovered number back into a character, we use the .... function.

a. ord()
b. chr()
c. str()
d. int()

6 📖 The XOR operation results in 1 when: ....

a. Both values are the same
b. Both values are different
c. Both values are zero only
d. Both values are one only

7 Applying XOR twice on the same data results in ....

a. Random data
b. Deleted data
c. Original data
d. Encrypted data

8 📖 A feature of XOR that makes it suitable for encryption is: ....

a. It completely changes the data format.
b. It is irreversible.
c. It is a reversible process used for both encryption and decryption
d. It works only on text

9 Bitwise operations are: ....

a. C. Operations performed on 0s and 1s inside the computer

B. Operations performed directly on words

c. Operations performed on images only

d. Slow and complex operations

10 The ord() function in Python is used to: ....

A. Convert text to random numbers

b. Convert a character to its Unicode number

c. Convert text to a list

d. Convert a number to a character

11 The XOR operation in Python is performed using the symbol: v

a. + b. * c. & d. ^

12 What is the result of 1 ^ 1?

a. One b. Two c. Zero d. Error

13 The reversible feature of XOR means: ....

a. The process is executed only once

b. XOR cannot be used for decryption

c. Performing XOR twice with the same key returns the original value

d. The process always changes the data

14 The code ord(original_char) ^ secret_key is used for ....

a. Encryption b. Deletion c. Sorting d. Printing

15 The secret key used in encryption should ....

a. be changed at every step

b. Be the same for both encryption and decryption

c. Not be used in decryption

d. Be a letter only

16 Bitwise operations are important because they ....

a. are a basic part of how computers make decisions and operations

b. Work on words only

c. Are not used in modern applications

d. Are limited to games only

2 Put (✓) or (✗):

1 📖 A Bit is the smallest storage unit in a computer. ( )
2 chr(65) would turn a number into a character. ( )
3 📖 The XOR operation results in 1 only when the two values are the same. ( )
4 If both bulbs are ON, the XOR result is 1. ( )
5 📖 The XOR operator can be used in encryption because it has a reversible feature. ( )
6 📖 operations are slow compared to regular arithmetic operations. ( )
7 Applying XOR twice with the same key returns the original message. ( )
8 📖 The chr( ) function in Python converts a number to its corresponding character in the Unicode table. ( )
9 📖 One feature of XOR is that it is inappropriate for encryption because it cannot be reversed. ( )
10 In Python, you can apply XOR directly to a letter without ord [ ]. ( )
11 📖 The computer internally deals with data in the form of 0s and 1s. ( )
12 XOR encryption is easier to break than the "fixed number" method . ( )
13 📖 The secret key should not be the same during decryption. ( )
14 📖 operations are the basis of encryption and pattern discovery inside the computer. ( )
15 📖 The XOR operation is used only for text and does not work on numbers. ( )

3 Complete the following sentences:

1 .... is the smallest unit of data stored in a computer .
2 To convert a character into its Unicode number in Python, we use the .... function.
3 The .... operator is represented by the symbol (^) in Python code.
4 In the XOR rule, the result is 1 only if the state of the two inputs is ....
5 To decrypt a message, you must use the .... secret key that was used for encryption.

Test Yourself
on Lessons 5&6

1 Choose the correct answer:

1 If you shift 'A' by (+2), it becomes: ………………… .
a. Letter C b. Letter B c. Letter Z d. Number 2

2 ………………… is the unreadable text after it has been encrypted
a. Plaintext b. Simple text c. Ciphertext d. Original text

3 Which function is used to convert a character into its Unicode number?
a. chr( ) b. ord( ) c. str( ) d. int( )

4 In Caesar Cipher (Shift Encryption), if we encrypt by adding a key, how do we decrypt? ………………… .
a. By adding the key again b. By multiplying the key
c. By subtracting the key d. By deleting the key

5 What is the result of the XOR operation (^) if both bits are the same ?
a. 1 b. 2 c. 0 d. Error

6 Why is XOR (^) widely used in encryption? ………………… .
a. Because it is the slowest operation
b. Because it is reversible
c. Because it only works on numbers
d. Because it cannot be undone

7 Which one is a "Simple" encryption? ………………… .
a. AES b. Bank security c. Caesar Cipher d. Face ID

2 Put (✓) or (✗):

1 Plaintext is the original message that is clear and easy to read. ( )
2 The chr( ) function converts a number back into its corresponding character. ( )
3 In XOR logic, the result is 1 only when the two input values are different. ( )
4 Computers understand Arabic letters directly without converting them into numbers. ( )
5 Simple encryption like Caesar Cipher is strong enough to protect modern global banks. ( )
6 Performing an XOR operation twice with the same secret key will recover the original message. ( )
7 Ransomware is a helpful type of encryption. ( )
8 Bitwise operations are the fastest way to process data. ( )

Summary of Unit 4

Lesson 1

- To analyze data in Python, we use specific libraries to read, process, and visualize Excel files using the following commands:
  - pip install pandas: It installs Pandas library for data analysis and reading Excel files.
  - pip install matplotlib : It installs matplotlib library for creating graphs.
- File Requirement: An Excel file (grades.xlsx) must exist in the same folder of the program.
- We use the Pandas library to bring the data into our program.
- The Code Explanation:

Code	Function
import pandas as pd	It imports pandas library, which helps us deal with data and tables.
df= pd.read_excel('grades.xlsx')	It reads data from a file "grades.xlsx" and stores it in a variable called df.
print(df.head())	It displays the first 5 rows of the Excel file.

- Basic Data Analysis:

  Once the data is loaded, we can perform statistical analysis on specific subjects:
  - Mean: grades.mean(): It calculates the average.
  - Max: grades.max(): It finds the highest score.
  - Success Count: (grades > 13).sum(): It counts students above a threshold.
- Visualization:
  - kind='bar': It creates a bar chart.
  - kind='pie': It creates a pie chart.
  - plt.show( ): It's always added after each plot to display it.

- Correlation (corr()): It measures the relationship between subjects.
  - 1: Strong positive (both go up).
  - 0: No relationship.
  - -1: Inverse relation

Lesson 2

- Concept and Usage:
  - In Python, conditional statements are used to make logical decisions by running code only if a condition is True.
- General Syntax:
  - if condition: # If the condition is True, execute this code.
  - else: # Otherwise, execute this code instead.
- Types of Conditional Statements:

1. Simple IF: It executes a code for one specific possibility.

```
Age = 18
if age >= 18:
print("Allowed to enter")
```

2. IF... ELSE: It chooses between two different paths (if the first fails, the second runs).

```
age = 16
if age > = 18:
    print("Allowed to enter")
else:
    print("Sorry, you cannot enter") # This line runs because
    16 is less than 18
```

3 IF... ELIF... ELSE: It checks multiple conditions in sequence. It stops as soon as it finds a true one.

```
mark = 85
if mark >= 90:
   print("Excellent")
elif mark >= 75:
   print("Very Good")  # This line runs because 85 is >= 75
elif mark >= 60:
   print("Good")
else:
   print("Fail")
```

Lesson 3

1 Loops:

» Loops help you repeat a specific task many times without rewriting the same code many times.

A) The for Loop:

- It's used when you know exactly how many times you want to repeat the code.

```
for i in range(5):
    print("Hello!")             # This will print "Hello!"  5 times
```

- range(5) starts at 0 and goes up to 4 (total of 5 iterations).

B) The While Loop:

- It repeats the code as long as a condition is True.

```
x = 0
while x < 3:
   print("I am learning!")
   x += 1   # Increment x
```

- Warning: You must include an increment (like x += 1) to avoid an Infinite Loop.

2 Functions

- We create functions using the def keyword.
- The function does not work until we call it!
- Some functions have parameters, which are inputs passed into the function to make it flexible.
- print( ): It shows the result on the screen.
- return: It sends the value back to the program to be saved in a variable.

Python - Prep2

```
def add(a, b):
    result = a + b
    print(f" The sum is: {result}")

add(3, 5)
```

Lesson 4

1 What are Data Structures?

- Data Structures in Python are ways to organize and store multiple pieces of data.
- You can think of them as specialized containers for different types of information.

Structure	Syntax	Usage	Notes
List	[ ]	Shopping lists, scores (can append, remove, sort).	Modifiable
Tuple	( )	Constant data like days of the week or coordinates	Fixed
Dictionary	{ }	Fast access by unique keys (e.g., student records)	Key-Value pairs

» Main Operations:

Operation	Code	Explanation
Add	grades. append(95)	It adds a new grade.
Delete	grades. remove(78)	It deletes a specific grade.
Sort	grades. sort	It sorts items in order.

Lesson 5

» Cryptography: It's the art of converting readable **(Plaintext)** into unreadable (Ciphertext) form.

» Uses:

- Correct use: WhatsApp, HTTPS
- Wrong use: Ransomware

» Key Functions:

- ord(): It converts character into Unicode Number (e.g., 'A' ⟶ 65).
- chr(): It converts Number into Character (e.g., 65 ⟶ 'A').

» Encryption Methods:

1. Simple Encryption (Caesar **Cipher**):
   - It shift letters by a specific number.
   - Encryption: Original Code + Key = Encrypted Code.
   - Decryption: Encrypted Code - Key = Original Code.
2. Complex Encryption (AES):
   - It uses complex mathematical equations and very long keys.
   - This is used by banks and major corporations.

Lesson 6

- Bitwise Operations:
  - They are the fastest and most professional way a computer processes data.
  - They are mathematical rules performed directly on these 1s and 0s.
- Bit: It's the smallest unit of data (1 or 0).
- The XOR Operator (^)
  - Outputs 1 if inputs are different.
  - Outputs 0 if inputs are the same.
- The Reversible Secret: XOR is used for professional encryption because applying the same key twice returns the original message.
  - Step 1: Message ^ Key = Ciphertext
  - Step 2: Ciphertext ^ Key = Message

Revision on Unit 4

Model Exam 1

1 Choose the correct answer:

1 The primary function of the pandas library is ....

a. drawing graphs
b. playing audio
c. analyzing data
d. creating websites

2 The XOR operation results in 1 when values are ....

a. equal
b. different
c. both zero
d. both one

3 If an "if" condition is False, the program ....

a. runs the code
b. skips it
c. stops completely
d. shows error

4 The keyword "def" is used to ....

a. create variable
b. start loop
c. print text
d. define function

5 .... is a data structure type that uses square brackets [ ].

a. Tuple
b. Set
c. List
d. Dictionary

6 Plaintext is a/an ....

a. encrypted text
b. unreadable text
c. readable text
d. secret key

7 .... is used to display a graph.

a. plt.show( )
b. plt.start( )
c. plt.run( )
d. plt.open( )

8 The library used for reading Excel files and data analysis is ....

a. matplotlib
b. pandas
c. math
d. grades

2 Put (✓) or (✗):

1. Bit is the smallest storage unit in a computer. ( )
2. XOR operation results in 1 only when the two values are equal. ( )
3. Bitwise operations are slow compared to regular arithmetic operations. ( )
4. The chr() function in Python converts a number to its character. ( )
5. The secret key does not have to be the same during decryption. ( )
6. Simple encryption like Caesar Cipher is still used for major banks. ( )
7. An else statement can be written without an if before it. ( )

Model Exam 2

1 Choose the correct answer:

1. .... library is used to creates graphs in Python.
   a. numpy b. pandas
   c. tkinter d. matplotlib
2. What command loads an Excel file in python?
   a. pd.load( ) b. pd.read_excel( )
   c. pd.open( ) d. df.read( )
3. To convert results into a dictionary format for easier reading, we use ....
   a. to_list() b. to_graph()
   c. to_excel() d. to_dict()
4. .... is the correct "if" statement syntax.
   a. if: condition b. if condition:
   c. condition if d. if (condition)
5. A "for" loop is used when iterations are ....
   a. condition based b. unknown
   c. run once d. known

6 To draw a Pie Chart for the average grades, we use ....

a. plot(kind='bar')
b. plot(kind='pie')
c. show(pie)
d. mean(shape)

7 The .append( ) function is used for ....

a. adding items
b. deleting items
c. sorting items
d. changing types

8 Which of the following is used to display the graph window

a. plt.show( )
b. plt.start( )
c. plt.run( )
d. plt.open( )

2 Put (✓) or (✗):

1 Index numbering in a list starts from 1. ( )

2 XOR is unsuitable for encryption because it cannot be reversed. ( )

3 The computer internally deals with data in form of 0s and 1s. ( )

4 Bitwise operations are the basis of encryption. ( )

5 Encryption is a way to protect information from unauthorized access. ( )

6 Lists in Python allow you to modify elements. ( )

7 A while loop can work without a condition. ( )

Model Exam 3

1 Choose the correct answer:

1 The python code " grades.mean( )" is used to calculate the ....

a. highest grade
b. lowest grade
c. average grade
d. column deletion

2 To install the matplotlib library, we use the code ....

a. pip install matplotlib
b. install pandas
c. pip install excel
d. get matplotlib

3 If the correlation between Math and ICT is 0.9, it means students good at Math are usually ....

a. bad at ICT
b. good at ICT too
c. only good at English
d. not successful

4 In Python, conditional statements are used to make ....

a. mathematical errors
b. logical decisions
c. complex variables
d. faster Internet

5 The .... statement is used to choose between exactly two choices.

a. IF only
b. IF ... ELSE
c. IF ... ELIF
d. nested list

6 .... are the inputs passed into a function.

a. Parameters
b. Outputs
c. Names
d. Results

7 Which function is used to generate a sequence of numbers?

a. List( )
b. Sequence( )
c. Number( )
d. Range( )

8 A "while" loop continues to execute as long as ....

a. the number of iterations is known
b. the condition is true
c. the number of iterations = 0
d. the condition is false

2 Put (✓) or (✗):

1 Anyone can read encrypted text easily without the key. ( )
2 Wrong use of encryption includes ransomware. ( )
3 The ord() function converts a character into a number. ( )
4 A Tuple's elements can be changed after definition. ( )
5 A Dictionary relies on keys to access values. ( )
6 Keys in a dictionary can be repeated. ( )
7 A for loop is suitable when iteration count is known. ( )

Model Exam 4

1 Choose the correct answer:

1. When checking multiple sequential conditions, we should use ....
   a. IF ... ELIF ... ELSE b. IF only
   c. software d. routers

2. The function df.corr() is used to calculate ....
   a. row count b. data removal
   c. subject correlation d. data average

3. To test multiple sequential conditions, use: ....
   a. if only b. else only
   c. if...elif...else d. print

4. A correct condition in Python is: ....
   a. if x = 5 b. if x == 5:
   c. if x => 5 d. if x =< 5

5. .... command is used to load an Excel file.
   a. pd.load_file( ) b. pd.read_excel( )
   c. pd.open( ) d. df.read( )

6. In Python data structures, index numbering always starts from ....
   a. -1 b. 1
   c. 0 d. 2

7. Dictionary keys must be: ....
   a. repeated b. unique
   c. strings only d. numbers only

8. The chr( ) function converts ....
   a. text b. character to number
   c. number to character d. encrypted text

2 Put (✓) or (✗):

1. Forgetting to change while-loop conditions causes infinite loops. ( )
2. A function does not work unless it is called. ( )
3. A function cannot contain parameters. ( )
4. Code inside a python function must be indented. ( )
5. A Tuple uses curly braces { }. ( )
6. A List is written using square brackets [ ]. ( )
7. Forgetting to change while-loop conditions causes infinite loops. ( )

Model Exam 5

1 Choose the correct answer:

1. A/An .... is a collection of items that can be modified, added, or deleted.
   a. List b. Tuple
   c. Constant d. Integer
2. The result of training AI on incomplete or unfair data is ....
   a. efficiency b. bias
   c. faster speed d. better storage
3. A "while" loop runs while the condition is ....
   a. Known b. True
   c. Zero d. False
4. No condition change in "while" causes ....
   a. an immediate stop b. a system error
   c. an infinite loop d. a single run
5. Decryption is the process of converting .... back into Plaintext.
   a. Ciphertext b. UNICODE
   c. the key d. complex equations

6 To find the number of items in a list, we use the .... function.

a. count()
b. len()
c. sum()
d. add()

7 A wrong use of encryption is ....

a. account security
b. data protection
c. website security
d. ransomware

8 The function .... calculates the total sum of all numbers in a collection.

a. len()
b. sum()
c. sort()
d. total()

2 Put (✓) or (✗):

1 The ord() function converts a character into a number. (   )

2 The secret key must be the same for encryption and decryption. (   )

3 The XOR operator is reversible and used in encryption. (   )

4 Simple encryption (like Caesar Cipher) is considered very secure for modern banking. (   )

5 A List cannot contain different data types. (   )

6 A Tuple is suitable for days of the week. (   )

7 Dictionaries allow adding elements after creation. (   )

Final Exams

Model Exam 1

1 Choose the correct answer:

1 The function used to find the smallest value in a dataset is ....

a. np.mean() b. print() c. np.min() d. np.max()

2 The XOR operation results in 1 when the two input values are ....

a. equal b. both zero c. different d. both one

3 Which of the following is the correct syntax for an "if" statement in Python?

a. if x = 5 b. if x == 5: c. if x => 5 d. if x =< 5

4 A .... is a fixed collection that cannot be modified after it is created.

a. List b. Tuple c. Dictionary d. Variable

5 The keyword "def" is used to .... in Python

a. create a variable. b. fefine a function.

c. create a loop. d. print text.

6 Which of the following uses square brackets [ ]?

a. List b. Tuple c. Set d. Dictionary

7 .... is a Python library used to create graphs like pie charts and bar charts.

a. NumPy b. pandas c. matplotlib d. logic theorist

2 Put (✓) or (✗):

1 Fairness in AI means treating all people without discrimination. (   )

2 The XOR operator can be used in encryption because it has a reversible feature. (   )

3 A Tuple's elements in python can be changed after they are defined. (   )

4 pd.to_datetime( ) can reject invalid dates like "2023-13-01". (   )

5 Artificial Intelligence can feel human emotions like joy and sadness. ( )

6 Bias in AI may occur due to incomplete or unfair data. ( )

7 The head( ) function in Python displays all data in the table completely. ( )

8 In shift encryption, a fixed value is subtracted to produce the ciphertext. ( )

Model Exam 2

1 Choose the correct answer:

1 .... built a famous test to see if a machine is intelligent.

a. Isaac Newton
b. Albert Einstein
c. Alan Turing
d. Al-Khwarizmi

2 In an artificial neuron, the formula for calculation is ....

a. (Inputs + Weights) × Bias
b. (Inputs × Weights) + Bias
c. (Inputs / Weights) - Bias
d. Weights + Bias

3 .... refers to the ability of machines to simulate human thinking.

a. Artificial Intelligence
b. Hardware
c. Router
d. LAN

4 .... in artificial neuron help(s) it make a decision even when inputs are zero

a. Bias.
b. Inputs.
c. Weights.
d. Input function.

5 What is meant by Plaintext?

a. The encrypted text.
b. Unreadable text.
c. The original clear text.
d. Text protected by a key.

6 A Dictionary stores data in the form of:

a. A list inside a list.
b. Values only without keys.
c. Unordered elements.
d. Key → Value

7 .... is a library is responsible for creating graphs in Python.

a. numpy
b. pandas
c. tkinter
d. matplotlib

2 Put (✓) or (✗):

1. The computer internally processes data in the form of 0s and 1s. (   )
2. A for loop is suitable when you know the number of iterations in advance. (   )
3. Weights in a neuron do not affect the final decision. (   )
4. The ord( ) function converts a character into a number. (   )
5. Data analysis helps in making fact-based decisions. (   )
6. A List cannot contain more than one type of data. (   )
7. Logic Theorist was one of the first programs to simulate human thinking. (   )
8. Bitwise operations are slow compared to regular arithmetic. (   )

Model Exam 3

1 Choose the correct answer:

1. Which of these can AI NOT do as well as humans?
   a. Analyze numbers b. Feel the beauty of art
   c. Recognize patterns d. Store data
2. If x = 10, what will print(x > 5) display?
   a. False b. True c. 10 d. Error
3. To add a new item to the end of a list, we use the .... function.
   a. .append() b. .add() c. .insert() d. .sum()
4. In Python, index numbering in data structures always starts from ....
   a. 1 b. 0 c. -1 d. 10
5. What is the result of 1 ^ 1 in a bitwise XOR operation?
   a. Zero b. One c. Two d. Error

6 ______ is considered a wrong use of encryption.

a. Securing accounts.
b. Encrypting data for protection.
c. Securing websites.
d. Ransomware.

7 The Threshold function in artificial neuron works as a/an ______.

a. probability.
b. On/Off switch.
c. color scale.
d. audio system.

2 Put (✓) or (✗):

1 The secret key does not have to be the same during decryption. ( )
2 Characters in video games can learn from the user's playstyle. ( )
3 The Threshold function gives values between 0 and 1 only. ( )
4 The mean can be calculated manually without NumPy. ( )
5 An else statement can be written without an if before it. ( )
6 The append() function is used to add a new item to the list. ( )
7 The Turing Test checks if a human can distinguish between a human and a machine. ( )
8 Deep Learning is an advanced type of Machine Learning. ( )

Model Exam 4

1 Choose the correct answer:

1 ______ command is used to load an Excel file.

a. pd.load_file( )
b. pd.read_excel( )
c. pd.open( )
d. df.read( )

2 ______ are used to give each input a level of importance in a neuron.

a. Weights
b. Outputs
c. Biases
d. Functions

3 The most powerful feature of XOR in encryption is that it is ______.

a. slow
b. reversible
c. permanent
d. invisible

4 To calculate the average of a column in pandas, we use ....

a. .mean() b. .max() c. .sum() d. .total()

5 A weather app that checks for "Sunny", "Rainy", or "Snowy" should use ....

a. if only b. if...else c. if...elif...else d. print

6 The .... function converts a Unicode number back into a character.

a. ord() b. chr() c. bin() d. int()

7 If we do not change the condition inside a "while" loop, ...

a. it will stop immediately. b. an infinite loop will occur.

c. a system error will occur. d. it will run only once.

2 Put (✓) or (✗):

1 Without an activation function, the neuron will not be able to make a decision. (   )

2 Encryption is not used in daily applications like WhatsApp or banks. (   )

3 An AI program cannot analyze colors or shapes in a painting. (   )

4 A condition in Python must end with a semicolon (;). (   )

5 Self-driving cars are considered among the complex problems that AI can solve. (   )

6 Artificial neurons are designed to imitate the way humans think. (   )

7 Identifying the type of data is a first step to build a neuron. (   )

Model Exam 5

1 Choose the correct answer:

1 .... is considered a human ability and not an artificial one.

a. Creativity and innovation. b. Pattern recognition.

c. Speed of data processing. d. Analyzing millions of data.

2 One of the functions of Bias is that: ....

a. It reduces the accuracy of the cell.

b. It prevents the cell from working.

c. It makes the cell more flexible. d. It cancels the use of inputs.

3 Which symbol is used for the XOR operator in Python?

a. & b. * c. ^ d. +

4 What is the function of the code: (grades > 90).sum( )?

a. Calculating student grades.

b. Comparing students with each other.

c. Reordering grades.

d. Calculating the number of students above 90.

5 The .... function calculates the number of items in a list.

a. sum() b. len() c. count() d. size()

6 We use a Tuple when we want data that is: ....

a. constantly changing. b. fixed

c. automatically deleted. d. based on keys and values.

7 Ancient civilizations tried to build .... that could work on their own.

a. automation systems b. Python libraries

c. digital bits d. smartphones

2 Put (✓) or (✗):

1 Text data can never be analyzed. ( )

2 Bitwise operations are the basis of encryption. ( )

3 Keys in a dictionary can be repeated without any problem. ( )

4 Weights in an artificial neuron help determine the importance of each input. ( )

5 The activation function is responsible for executing the cell's final decision. ( )

6 Anyone can read encrypted text easily without the encryption key. ( )

7 plt.show( ) is important to display the graph. ( )

8 The start of Artificial Intelligence started only 5 years ago. ( )

Model Exam 6

1 Choose the correct answer:

1 .... is a library used for data visualization in Python.

a. Pandas b. NumPy c. Datetime d. Matplotlib

2 The activation function is responsible for:

a. Managing memory. b. Calculating weights.

c. Storing data. d. Making the final decision.

3 What happens if the first condition in an if...elif...else chain is met?

a. All conditions are executed.

b. Only the elif condition is executed.

c. A warning appears.

d. The rest of the conditions are ignored.

4 "HTTPS" at the start of a website address indicates the use of ....

a. Encryption b. Viruses c. High speed d. Only images

5 To install the pandas library, we use the command

a. pip install pandas
b. install pandas
c. get pandas
d. setup pandas

6 One characteristic of Dictionary Keys is that they.

a. Can be repeated.
b. Must be unique.
c. Cannot be strings.
d. Must be numbers only.

7 What is meant by Plaintext?

a. The encrypted text.
b. Unreadable text.
c. The original clear text.
d. Text protected by a key.

2 Put (✓) or (X):

1 Pandas library is used to clean and process data. ( )

2 Artificial neurons are used only in translating languages and are not used in image recognition. ( )

3 AI must be designed to be fair and equitable for everyone. ( )

4 The return statement is used only to display the result on the screen. ( )

5 XOR operation results in 1 only when the two values are equal. ( )

6 Using AI to improve the lives of others is a responsible use. ( )

7 A Dictionary does not allow adding new elements after they are created. ( )

8 In shift encryption, a fixed value is added to the character's number. ( )

Model Exam 7

1 Choose the correct answer:

1 To install the pandas library, we use the command ....

a. setup pandas
b. install pandas
c. get pandas
d. pip install pandas

2 The XOR operation in Python is performed using the symbol:

a. +
b. *
c. &
d. ^

3 .... is an example of AI used to understand human speech.

a. Voice assistants
b. Smart vacuums
c. Printers
d. Scanners

4 .... is the process of turning clear message into unreadable code.

a. Decryption
b. Encryption
c. Data analysis
d. Plotting

5 Self-driving cars are an example of AI in:

a. Homes.
b. Education.
c. Transportation.
d. Medicine.

6 Which of the following uses square brackets [ ]?

a. List
b. Tuple
c. Set
d. Dictionary

7 The "Logic Theorist" was an early program that could solve ....

a. Car engines
b. Video games
c. Medical cases
d. Mathematical problems

2 Put (✓) or (✗):

1 The mean() function produces a decimal number even if the results are whole numbers. (   )

2 Weights in an artificial neuron help determine the importance of each input. (   )

3 It is safe to trust all AI results without verifying them. (   )

4 A Tuple's elements can be changed after they are defined. (   )

5 Bias in a neuron can help it give results even if inputs are zero. ( )

6 A function can be called more than once within the same program. ( )

7 Pandas can be used to create graphs. ( )

8 Identifying the data type is a necessary step to build an artificial neuron. ( )

Model Exam 8

1 Choose the correct answer:

1 .... means treating everyone equally without bias in AI.

a. Privacy b. Fairness c. Complexity d. Speed

2 The Sigmoid function gives:

a. A negative number.
b. A number between 0 and 1
c. A random number.
d. A number greater than 100.

3 The .... function replaces negative values with zero but keeps positive values.

a. Sigmoid b. ReLU c. Threshold d. Bias

4 The keyword "def" is used in python to:

a. Define a function.
b. Create a variable.
c. Create a loop.
d. Print text.

5 .... is the encrypted, unreadable text.

a. Plaintext b. Ciphertext c. Key d. Source code

6 What does df.head( ) do?

a. Displays the first 5 rows.
b. Deletes the first 5 rows.
c. Displays the last 5 rows.
d. Displays the number of columns.

7 The .... function replaces negative values with zero but keeps positive values.

a. Sigmoid b. ReLU c. Threshold d. Bias

5 Bias in a neuron can help it give results even if inputs are zero. ( )

6 A function can be called more than once within the same program. ( )

7 Pandas can be used to create graphs. ( )

8 Identifying the data type is a necessary step to build an artificial neuron. ( )

Model Exam 8

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1 .... means treating everyone equally without bias in AI.
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a. A negative number. b. A number between 0 and 1
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4 The keyword "def" is used in python to:
a. Define a function. b. Create a variable.
c. Create a loop. d. Print text.

5 .... is the encrypted, unreadable text.
a. Plaintext b. Ciphertext c. Key d. Source code

6 What does df.head( ) do?
a. Displays the first 5 rows. b. Deletes the first 5 rows.
c. Displays the last 5 rows. d. Displays the number of columns.

7 The .... function replaces negative values with zero but keeps positive values.
a. Sigmoid b. ReLU c. Threshold d. Bias

2 Put (✓) or (X):

1. Machine Learning is a branch of AI that allows computers to learn from mistakes. ( )
2. Bias helps the neuron give results even in the absence of inputs. ( )
3. pd.read_excel() is used to load data from an Excel file in pandas. ( )
4. A Bit is the largest unit of data measurement. ( )
5. In Python, The code inside a function must be indented. ( )
6. Dictionaries rely on using keys to access values. ( )
7. A Tuple uses curly braces { }. ( )
8. The return statement is used to send a result out of a function. ( )

Model Exam 9

1 Choose the correct answer:

1. The Threshold function works as a/an ....
   a. probability. b. On/Off switch.
   c. color scale. d. audio system.
2. Caesar Cipher is an example of .... encryption.
   a. Simple (Shift) b. Modern bank
   c. Complex d. Irreversible
3. .... is the smallest unit of data a computer can understand.
   a. Byte b. Bit c. List d. Function
4. A Dictionary is useful for storing:
   a. Organized data. b. Fixed data only.
   c. Unique numbers only. d. Unordered elements.
5. If we do not change the condition inside a "while" loop:
   a. It will stop immediately. b. A system error will occur.
   c. An infinite loop will occur. d. It will run only once.

6 .... is considered a correct use of encryption.

a. Protecting messages.　b. Spreading viruses.

c. Demanding ransom.　d. Deleting data.

7 Python is popular for AI because it has ....

a. no support　b. powerful libraries

c. only 10 commands　d. no math

2 Put (✓) or (✗):

1 The np.mean( ) function is used to find the smallest value in a list. (　)

2 When connecting thousands of neurons, the network improves itself over time. (　)

3 No one has the right to use your personal data without your consent. (　)

4 Functions help organize code into reusable blocks. (　)

5 A function does not work unless it is called. (　)

6 Shift encryption relies on swapping words. (　)

7 df.corr( ) helps in knowing the relationship between different subjects. (　)

8 AI can feel deep emotions like sadness or joy in a painting. (　)

Model Exam 10

1 Choose the correct answer:

1 .... are used to pass information into a function.

a. Parameters　b. Returns　c. Loops　d. Names

2 "MYCIN" was an early AI program designed to act as a robot ....

a. pilot　b. doctor　c. chef　d. teacher

3 A .... can process complex tasks like image recognition that a single neuron cannot.

a. neural network　b. calculator　c. bit　d. router

4 In a dictionary, keys must be ....

a. repeated
b. unique
c. numbers only
d. zero

5 Which of the following is a correct condition in Python?

a. if x = 5
b. if x == 5:
c. if x => 5
d. if x =< 5

6 The .append( ) function is used to ....

a. delete an item from the list.
b. add a new item to the list.
c. sort the items.
d. change the type of the list.

7 What is the primary function of the pandas library?

a. Drawing graphs.
b. Playing audio files.
c. Analyzing data and reading Excel files.
d. Creating websites.

2 Put (✓) or (✗):

1 Python can be used to analyze date and time data. (   )

2 The final goal of the neuron's work is to obtain the final decision. (   )

3 Simple encryption like Caesar Cipher is still used for bank security. (   )

4 Voice assistants use Natural Language Processing (NLP). (   )

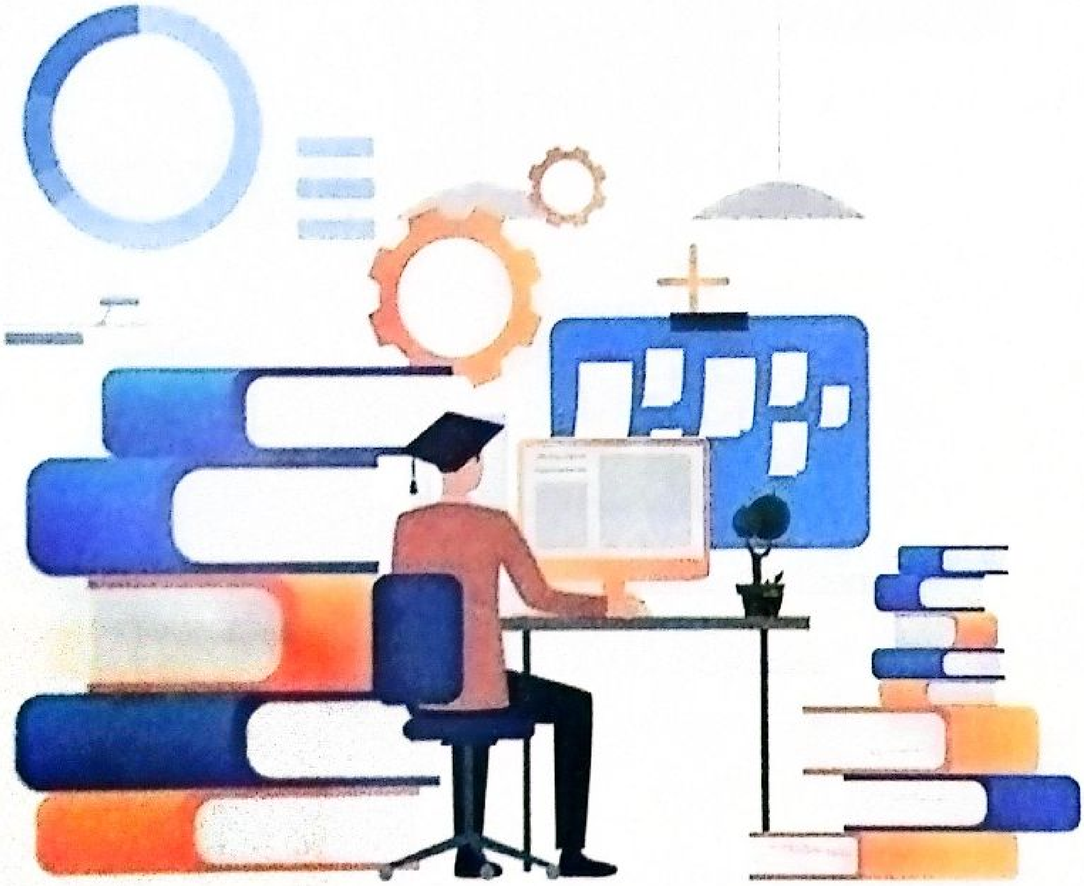
5 A while loop can work without a condition. (   )

6 A List is written using square brackets [ ]. (   )

7 Encryption is a way to protect information from unauthorized access. (   )

8 plt.show( ) displays the graph on the screen. (   )

Model Answers



Unit 3

Lesson 1

1
1 b 2 c 3 a 4 b 5 b
6 c 7 a 8 c 9 b 10 a
11 d 12 c 13 a 14 d

2
1 ✗ 2 ✓ 3 ✓ 4 ✓ 5 ✗
6 ✓ 7 ✓ 8 ✓ 9 ✗ 10 ✗
11 ✓ 12 ✓ 13 ✓ 14 ✗ 15 ✓

3
1 Alan Turing 2 Dartmouth
3 Mycin 4 Machine Learning
5 Deep Learning

Lesson 2

1
1 b 2 c 3 c 4 d 5 a
6 b 7 c 8 b 9 b 10 a
11 d 12 c 13 b 14 c 15 b
16 c

2
1 ✗ 2 ✓ 3 ✓ 4 ✗ 5 ✓
6 ✓ 7 ✓ 8 ✓ 9 ✗ 10 ✓
11 ✗ 12 ✓ 13 ✗ 14 ✓ 15 ✗
16 ✓ 17 ✓ 18 ✓

3
1 Artificial Intelligence
2 Siri - Alexa -Google Assistant
3 Vacuum cleaner
4 Chatgpt
5 Suggestions / Recommendations
6 Self-driving car

Test Yourself on Lessons 1&2

1
1 c 2 c 3 d 4 a 5 b
6 c 7 b

2
1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✗
6 ✓ 7 ✗ 8 ✗

Lesson 3

1
1 c 2 b 3 a 4 c 5 b
6 d 7 c 8 c 9 b 10 d
11 b 12 c 13 d 14 b 15 a
16 d 17 b

2
1 ✓ 2 ✓ 3 ✓ 4 ✓ 5 ✗
6 ✓ 7 ✗ 8 ✓ 9 ✓ 10 ✗
11 ✓ 12 ✗ 13 ✓ 14 ✓ 15 ✗
16 ✗ 17 ✓

Lesson 4

1
1 b 2 c 3 a 4 b 5 b
6 d 7 c 8 d 9 a 10 b
11 b 12 b 13 c 14 c 15 a
16 b 17 d 18 c

2
1 ✓ 2 ✓ 3 ✗ 4 ✓ 5 ✗
6 ✓ 7 ✗ 8 ✗ 9 ✓ 10 ✓
11 ✓ 12 ✗ 13 ✓ 14 ✓ 15 ✗
16 ✓ 17 ✗

3
1 Artificial Neuron 2 Inputs
3 Weights 4 Bias
5 Activation Function 6 Threshold
7 Bias

Test Yourself on Lessons 3&4

1
1 b 2 c 3 b 4 b 5 c
6 c 7 c

2
1 ✓ 2 ✗ 3 ✓ 4 ✓ 5 ✗
6 ✓ 7 ✗ 8 ✓

Lesson 5

1
1 b 2 d 3 a 4 c 5 a
6 c 7 a 8 c 9 b 10 c
11 d 12 c 13 b 14 b 15 d
16 c

2
1 ✓ 2 ✗ 3 ✗ 4 ✓ 5 ✗
6 ✗ 7 ✓ 8 ✗ 9 ✓ 10 ✓
11 ✗ 12 ✓ 13 ✗ 14 ✓ 15 ✗
16 ✓ 17 ✗

Lesson 6

1
1 a 2 c 3 b 4 d 5 d
6 a 7 c 8 c 9 b 10 d
11 c 12 a 13 c 14 b 15 c
16 d 17 c

2
1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✗
6 ✗ 7 ✓ 8 ✓ 9 ✗ 10 ✓
11 ✗ 12 ✓ 13 ✓ 14 ✗ 15 ✗
16 ✓ 17 ✓ 18 ✗ 19 ✓ 20 ✓

Test Yourself on Lessons 5&6

1
1 b 2 c 3 b 4 c 5 c
6 d 7 c

2
1 ✗ 2 ✗ 3 ✓ 4 ✗ 5 ✓
6 ✓ 7 ✗ 8 ✗

Model Exams

MODEL (1)

1
1 a 2 a 3 b 4 a 5 c
6 c 7 a

2
1 ✓ 2 ✗ 3 ✓ 4 ✗ 5 ✓
6 ✗ 7 ✗ 8 ✓

MODEL (2)

1
1 b 2 c 3 c 4 a 5 c
6 b 7 c

2
1 ✓ 2 ✗ 3 ✓ 4 ✗ 5 ✓
6 ✗ 7 ✗ 8 ✗

MODEL (3)

1
1 b 2 b 3 c 4 b 5 a
6 c 7 b

2
1 ✓ 2 ✓ 3 ✓ 4 ✗ 5 ✓
6 ✗ 7 ✓ 8 ✓

MODEL (4)

1
1 b 2 c 3 d 4 b 5 a
6 a 7 c

2
1 ✓ 2 ✗ 3 ✓ 4 ✗ 5 ✓
6 ✓ 7 ✓ 8 ✗

MODEL (5)

1
1 b 2 c 3 a 4 b 5 d
6 b 7 a

2
1 ✗ 2 ✓ 3 ✓ 4 ✗ 5 ✓
6 ✗ 7 ✓ 8 ✓

Unit 4

Lesson 1

1
1 c 2 d 3 b 4 c 5 b
6 a 7 b 8 d 9 c 10 c
11 b 12 b 13 d 14 c 15 b
16 a 17 c 18 b

2
1 ✓ 2 ✗ 3 ✗ 4 ✗ 5 ✓
6 ✗ 7 ✗ 8 ✓ 9 ✗ 10 ✓
11 ✓ 12 ✗ 13 ✓ 14 ✗ 15 ✗
16 ✓ 17 ✗ 18 ✓

Lesson 2

1
1 b 2 d 3 b 4 c 5 c
6 b 7 a 8 a 9 c 10 b
11 c 12 c 13 d 14 b 15 a

2
1 ✓ 2 ✓ 3 ✗ 4 ✗ 5 ✓
6 ✓ 7 ✓ 8 ✗ 9 ✓ 10 ✓
11 ✓ 12 ✗ 13 ✓ 14 ✗ 15 ✓
16 ✓ 17 ✗

Test Yourself on Lessons 1&2

1
1 b 2 a 3 c 4 b 5 c
6 d 7 c

2
1 ✓ 2 ✗ 3 ✓ 4 ✗ 5 ✓
6 ✓ 7 ✓ 8 ✗

Lesson 3

1
1 d 2 b 3 a 4 c 5 a
6 c 7 b 8 b 9 c 10 c
11 d 12 b 13 b 14 d 15 a
16 c

2
1 ✓ 2 ✗ 3 ✗ 4 ✓ 5 ✗
6 ✓ 7 ✓ 8 ✗ 9 ✗ 10 ✓
11 ✗ 12 ✓ 13 ✓ 14 ✗ 15 ✓
16 ✓

3
1 For 2 Def
3 While 4 Indentation
5 Return

Lesson 4

1
1 c 2 c 3 a 4 d 5 b
6 a 7 c 8 b 9 b 10 c
11 b 12 b 13 a 14 d 15 b
16 c 17 c 18 b 19 a

2
1 ✓ 2 ✓ 3 ✓ 4 ✗ 5 ✓
6 ✓ 7 ✗ 8 ✗ 9 ✓ 10 ✓
11 ✓ 12 ✗ 13 ✗ 14 ✓ 15 ✗
16 ✗ 17 ✓ 18 ✓ 19 ✓ 20 ✗

Test Yourself on Lessons 3&4

1
1 c 2 b 3 a 4 a 5 c
6 b 7 c

2
1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✓
6 ✗ 7 ✓ 8 ✗

Lesson 5

1.
1. c 2. d 3. a 4. a 5. d
6. b 7. c 8. a 9. b 10. c
11. d 12. b 13. b 14. c 15. c
16. a 17. b 18. b

2.
1. ✗ 2. ✓ 3. ✓ 4. ✗ 5. ✗
6. ✓ 7. ✓ 8. ✗ 9. ✗ 10. ✓
11. ✓ 12. ✓ 13. ✓ 14. ✓ 15. ✓
16. ✗ 17. ✓ 18. ✗

Lesson 6

1.
1. c 2. c 3. b 4. d 5. b
6. b 7. c 8. c 9. a 10. b
11. d 12. c 13. c 14. a 15. b
16. a

2.
1. ✓ 2. ✓ 3. ✗ 4. ✗ 5. ✓
6. ✗ 7. ✓ 8. ✓ 9. ✗ 10. ✗
11. ✓ 12. ✗ 13. ✗ 14. ✓ 15. ✗

3.
1. Bit 2. Ord ( )
3. Xor 4. Different
5. Same

Test Yourself on Lessons 5&6

1.
1. a 2. c 3. b 4. c 5. c
6. b 7. c

2.
1. ✓ 2. ✓ 3. ✓ 4. ✗ 5. ✗
6. ✓ 7. ✗ 8. ✓

Model Exams

MODEL (1)

1.
1. c 2. b 3. b 4. d 5. c
6. c 7. a 8. b

2.
1. ✓ 2. ✗ 3. ✗ 4. ✓ 5. ✗
6. ✗ 7. ✗

MODEL (2)

1.
1. d 2. b 3. d 4. b 5. d
6. b 7. a 8. a

2.
1. ✗ 2. ✗ 3. ✓ 4. ✓ 5. ✓
6. ✓ 7. ✗

MODEL (3)

1.
1. c 2. a 3. b 4. b 5. b
6. a 7. d 8. b

2.
1. ✗ 2. ✓ 3. ✓ 4. ✗ 5. ✓
6. ✗ 7. ✓

MODEL (4)

1.
1. a 2. c 3. c 4. b 5. b
6. c 7. b 8. c

2.
1. ✓ 2. ✓ 3. ✗ 4. ✓ 5. ✗
6. ✓ 7. ✓

MODEL (5)

1.
1. a 2. b 3. b 4. c 5. a
6. b 7. d 8. b

2.
1. ✓ 2. ✓ 3. ✓ 4. ✗ 5. ✗
6. ✓ 7. ✓

Final Exams Answers

Final Exam (1)

1
1 c 2 c 3 b 4 b 5 b
6 a 7 c

2
1 ✓ 2 ✓ 3 ✗ 4 ✓ 5 ✗
6 ✓ 7 ✗ 8 ✗

Final Exam (2)

1
1 c 2 b 3 a 4 a 5 c
6 d 7 d

2
1 ✓ 2 ✓ 3 ✗ 4 ✓ 5 ✓
6 ✗ 7 ✓ 8 ✗

Final Exam (3)

1
1 b 2 b 3 a 4 b 5 a
6 d 7 b

2
1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✗
6 ✓ 7 ✓ 8 ✓

Final Exam (4)

1
1 b 2 a 3 b 4 a 5 c
6 b 7 b

2
1 ✓ 2 ✗ 3 ✗ 4 ✗ 5 ✓
6 ✓ 7 ✓ 8 ✗

Final Exam (5)

1
1 a 2 c 3 c 4 d 5 b
6 a 7 a

2
1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✓
6 ✗ 7 ✓ 8 ✗

Final Exam (6)

1
1 d 2 d 3 d 4 a 5 a
6 b 7 c

2
1 ✓ 2 ✗ 3 ✓ 4 ✗ 5 ✗
6 ✓ 7 ✗ 8 ✓

Final Exam (7)

1
1 d 2 d 3 a 4 b 5 c
6 a 7 d

2
1 ✓ 2 ✓ 3 ✗ 4 ✗ 5 ✓
6 ✓ 7 ✗ 8 ✓

Final Exam (8)

1
1 b 2 b 3 b 4 a 5 b
6 a 7 b

2
1 ✓ 2 ✓ 3 ✓ 4 ✗ 5 ✓
6 ✓ 7 ✗ 8 ✓

Final Exam (9)

1
1 b 2 a 3 b 4 a 5 c
6 a 7 b

2
1 ✗ 2 ✓ 3 ✓ 4 ✓ 5 ✓
6 ✗ 7 ✓ 8 ✗

Final Exam (10)

1
1 a 2 b 3 a 4 b 5 b
6 b 7 c

2
1 ✓ 2 ✓ 3 ✗ 4 ✓ 5 ✗
6 ✓ 7 ✓ 8 ✓